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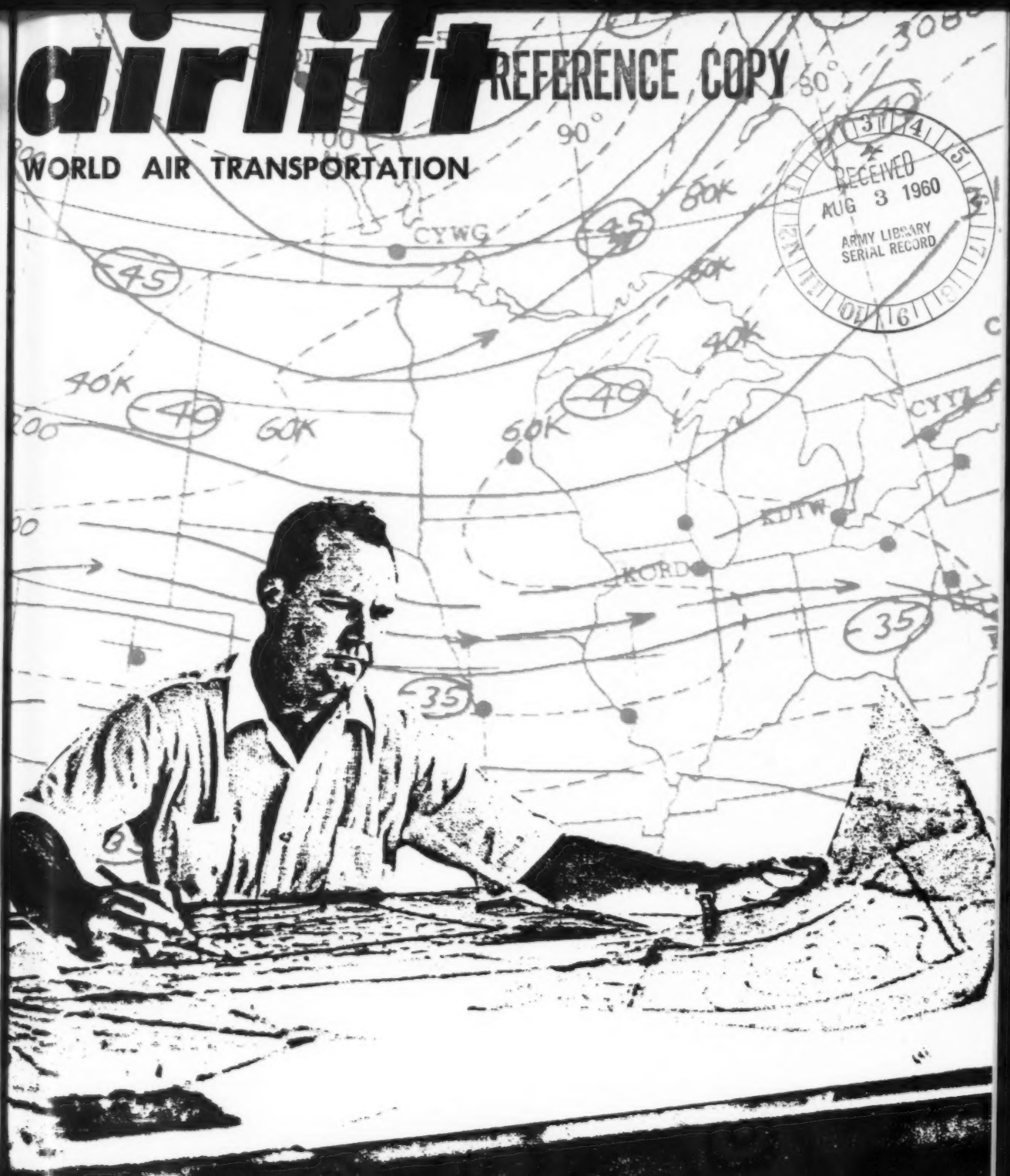

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All About Clear Air Turbulence . . 22

OFFICE OF THE PRESIDENT • THE KAMAN AIRCRAFT CORPORATION • BLOOMFIELD, CONN.

MEMO TO MICHAEL:

Your recent letter to the company has been brought to my attention. I am particularly interested in this paragraph,

I am in the fifth grade at Braun School and am very interested in aviation. When I grow up I want to be a aeronautical Engineer if my mother will let me

**

Michael, I certainly hope you keep your desire to make a career in aviation. In my opinion it is one of the most challenging opportunities for the young men of America. The helicopter industry, and aviation in general, is helping to keep our country strong and we look forward to the help that boys like you can give when your time comes. The backbone of the aircraft industry is the engineer. We will always need good engineers with imagination and vision. You have that vision now. Please keep it. I'm sure that you can count on your mother's support when you are ready to take your place among the other young men who are playing a vital role in a vital industry.

Sincerely,

Charles H Kaman

. . . IN NATIONAL DEFENSE

KAMAN IS PART OF THE PLAN

**Facsimile of a letter to the company

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Iceguard—the precious "ounce of prevention"—scotches icing hazards on the Boeing 707's empennage by efficient *electrothermal action.*

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X-ray photo reveals Goodyear's strict quality control in manufacturing Iceguard. Unbroken heating wires are perfectly spaced for efficient action. Iceguard comes in two types: electrically conductive rubber and with knitted wire elements embedded in rubber.

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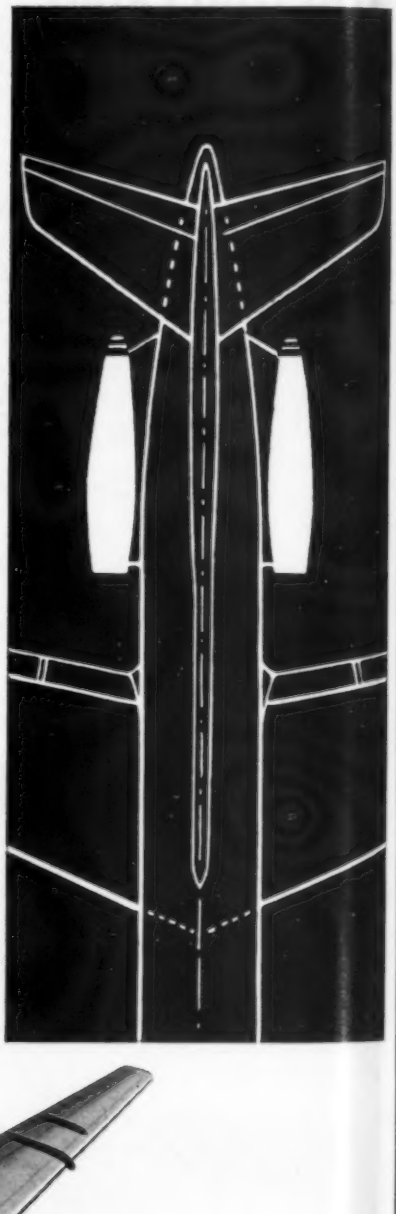

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airlift

WORLD AIR TRANSPORTATION

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THIS MONTH'S COVER—Chief weapon against the elusive hazard of high altitude clear air turbulence is the U.S. Weather Bureau's high altitude facsimile network which supplies data on upper air wind speeds four times a day. Analyst Marshall F. Grace is shown preparing such a chart at Suitland, Md. weather station. Closely-spaced lines on chart in background denote jet stream, one source of potential turbulence.

See pages 22-25.

RB-66 modified to accommodate General Electric CJ-805-23C, has been flying since February, 1960. Aircraft recently completed cross-country tour.

Aft-fan Powered RB-66 Tours United States

EDWARDS AFB, Calif.—General Electric's turbofan-powered flight test Douglas RB-66 took off from here recently on a cross-country tour which gave aviation observers their first opportunity to see and hear General Electric aft-fan engines in action.

The tour was a continuation of flight tests begun in February, 1960, when two General Electric aft-fan engines powered the modified RB-66 in this country's first all-turbofan flight with American-made engines. The aircraft has demonstrated outstanding performance in subsequent tests.

During the tour, observers were able to study the aft-fan engine at close range. The design couples the aft fan with G.E.'s proven basic gas generator to provide up to 40 per cent more takeoff thrust and an improvement in specific fuel consumption of up to 15 per cent over straight turbojet engines.

Following a non-stop cross-country flight, the RB-66 made its first stop at Farmingdale Airport, Long Island. Elapsed flight time of five hours 20 minutes included 30 minutes holding, let down through 20,000 feet of clouds to a 1500 foot ceiling, and three low-level flybys.

From Farmingdale, the RB-66 flew to Andrews AFB in Washington, D. C. where government officials watched the aircraft's performance at low altitude. Later, they had a close look at the CJ-805-23 engines with nacelle doors open.

At Wright-Patterson AFB the aft-fan powered test plane underwent close scrutiny by Air Force officials. Most of the comments concerned the short takeoff run and over-all low noise level of the aft-fan engines. Decibel readings taken on the field further verified the intrinsically good noise level characteristics of the aft-fan design.

The test program also provided a demonstration of General Electric's 40-kva hydraulic constant-speed drive with aft-fan engines. The system provides constant input speed for the ship's G-E a-c electrical generators. The two units aboard the RB-66 are the units which completed General Electric's earlier turbojet flight test program. The same accessory package is used aboard the Convair 880 and 990.

Aft-fan engines like those presently powering the RB-66 are scheduled to fly this fall on the Convair 990 Coronado and early next year aboard General Electric's Caravelle VII. Other members of G.E.'s growing aft-fan engine family now being considered by the aviation industry for military and commercial applications are the 4000 pound thrust-class CF700 and the 22,000 pound thrust-class MF239. This engine and other military versions of the aft-fan engine benefit from a 90 per cent reduction of infra-red radiation over straight turbojets.

Following a final stop at Wichita, Kansas, the RB-66 returned home to Edwards AFB, California, to continue an exhaustive test program.

For additional details on General Electric's aft-fan flight test program, check GED-4117 and 4192. Information on constant-speed drive systems is available in GEA-6890, on the CF700 in GED-3986, and on the MF239 in GED-5005. For information on aft fan IR radiation check GED-5006. See coupon.

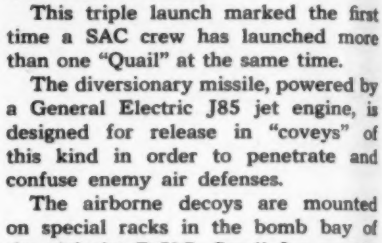
Strategic Air Command Records Triple Launch of GAM-72 "Quail" Decoy Missile

EGLIN AFB—A Strategic Air Command bomber has recorded a triple launch of three McDonnell GAM-72 "Quail" decoy missiles into free flight over the Eglin Gulf Test Range off the west coast of Florida.

This triple launch marked the first time a SAC crew has launched more than one "Quail" at the same time.

The diversionary missile, powered by a General Electric J85 jet engine, is designed for release in "coveys" of this kind in order to penetrate and confuse enemy air defenses.

The airborne decoys are mounted on special racks in the bomb bay of the eight-jet B-52G. Small fins remain folded around the body of the "Quail" until it is moved into launching position. This space-saving feature makes room for the decoys without interfering with other weapons carried by the SAC aircraft.



J85 powered GAM-72 "Quail" diversionary missile simulates B-52 on enemy radar screens.

After launching, the missiles fly in different directions but at the same speed as the big SAC bomber—more than 650 mph.

Each "Quail" in free flight produces a "blip" on enemy radar screens like that of the mother aircraft. The enemy, confronted by a series of diverging blips, is faced with the problem of determining which is the real bomber.

Slightly more than 10 feet long, the "Quail" uses ingenious electronic equipment to simulate the massive B-52G on radar screens.

When testing is complete, SAC B-52G's will be equipped with several GAM-72 "Quail" as well as two powerful GAM-77 "Hound Dog" air-to-surface missiles.

For additional information on the J85's adaptability to missile and other applications, check GED-4095. See coupon.

NEWS

A report about progress in research and products from the Flight Propulsion Division of the General Electric Company

Caravelle VII Powerplant Test Program Under Way

TOULOUSE, France—Aircraft #42, the General Electric Caravelle, has been completed at Sud Aviation's Toulouse plant. Scheduled for mid-summer delivery, the ship will become the first aft-fan CJ-805-23C powered Caravelle VII.

Meanwhile, around the world, -23 testing is under way at an accelerated pace. Here is a brief summary of tests under way or already completed.

At Toulouse, wind-tunnel tests of an 18 percent nacelle scale model and of a six percent Caravelle VII scale model have demonstrated excellent low-speed aerodynamic characteristics of the aircraft, nacelles, and thrust reversers.

At Amsterdam, the Netherlands, high-speed wind-tunnel testing has demonstrated excellent characteristics using an eight percent nacelle scale model and a four percent scale aircraft model.

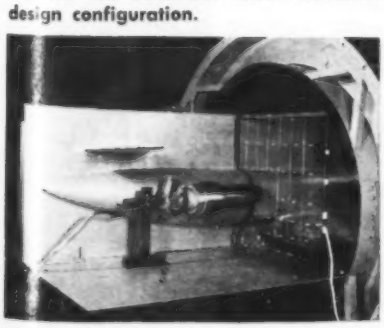
At Santa Monica, California, Douglas Aircraft is mating a Caravelle VII nacelle mock-up to a -23C mock-up delivered ahead of schedule. Work to date has confirmed ease of installation.

At Edwards Air Force Base, California, General Electric has completed tests using a 25 percent nacelle scale model mounted on a pylon under the wing of a flight test XF4D. Aerodynamic characteristics of the nacelle are excellent.

At Cincinnati, Ohio, static load testing of a -23C has demonstrated the engines capability to support the Caravelle VII nacelle. Thrust reverser configuration has been successfully tested using a 1/12th scale aircraft, nacelle, and thrust reverser model. At General Electric's Peebles, Ohio, facility, continuing test-cell runs are demonstrating -23C and thrust reverser performance.

For additional Caravelle VII information, check GED-4176 Caravelle brochure. See coupon.

Scale-model thrust reverser tests using 1/12 scale model of the -23C installation on the Caravelle have confirmed design configuration.



Diverted J85 thrust will power the Bell X-14 this year in a NASA test program.

General Electric's Small Engines Proving Versatile Power Source for VTOL Development

MOFFET AFB, Calif.—A variety of vertical takeoff and landing aircraft are now in development with versatile General Electric small gas turbine engines as the power source.

A lift-fan concept is being evaluated at Moffet Air Force Base, where a dry J85/lift-fan combination is undergoing wind-tunnel testing. J85-powered lift fans hold promise for a broad range of VTOL configurations with the capability of taking off straight up, flying forward at high speeds, and hovering.

In another program, diverted thrust from a J85 turbojet will power the Bell X-14, which NASA is using to test the feasibility of advanced propulsion and control techniques for VTOL and other future aircraft. X-14 flight testing is programmed for later this year.

General Electric's T58 turboshaft engine is the powerplant for two experimental VTOL aircraft which are scheduled to fly this year. Kaman's K-16 combines semi-tilt wing, deflector flaps, and cyclic-pitch propellers. The Fairchild M224 attains VTOL capability from deflected slipstream on the wing's trailing edge.

G.E. is also developing the T64 turboprop/turboshaft engine. Designed to operate continuously from 45 degrees below to 110 degrees above the horizontal, the T64 is especially suited for tilt-wing VTOL applications.

For additional information on the J85, check GED-4095. Check GED-3985 for T58 information, SAE-110A for T64 details. See coupon.

ENGINEERS—If flight propulsion engineering interests you, write to:
R. Marmaroli, Dept. 712A
Professional Placement Center
570 Lexington Avenue
New York, New York

FOR MORE DETAILED INFORMATION on these and other developments in General Electric products, contact your nearest G.E. Flight Propulsion Division representative or indicate below the brochures you would like to receive.

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Schenectady 5, N. Y.

- ☐ GED-4117 and 4192 "Progress Reports"
- ☐ GEA-6890, "Constant-Speed Drives"
- ☐ GED-3986, "CF700-1 Turbofan"
- ☐ GED-5005, "MF239C Aft Turbofan Power"
- ☐ GED-5006, "Aft Fan IR Radiation"
- ☐ GED-4095, "J85 Turbojet"
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Why Not a Truly Spartan Low-Fare 'Airbus'?

PROBABLY EVERY EXECUTIVE in air transportation will agree that the present system of first-class and coach (or tourist) service in the U.S. leaves a few things to be desired.

Certainly the public is more confused than not. A first-class fare will provide every range of seat comfort from luxury to the tightest squeeze, depending upon airline, equipment and the time of day or night. The low-fare passenger, on the other hand, is not infrequently treated to first-class configuration, again depending upon line, equipment and time of flight.

It isn't easy to provide a single first-class and a single coach standard of comfort throughout the industry so long as there are wide variations in equipment (DC-3s to jets), individual company philosophies, and such problems as turnarounds and utilization.

Having said all of this, it seems to us that there is room, or shortly will be, for a third and more clear-cut standard of service with still lower fares on short and intermediate-haul high-density routes. Not only would there be an outlet for idle piston-engine equipment, but air transport could begin to tap a wider market where price, and chiefly price, is the motivating market factor. Fares with present seating configurations can't be cut. There are very few areas where the airlines can cut costs sufficiently to break into a lower and mass market.

Please hear us out. Don't say you've heard it all before. While, personally, we have been gratefully spared from the harassments of operating an airline, thus enabling us to speak out with impunity if not by reason of experience, we do believe the time is approaching when the airlines must study seriously a class of air service completely without frills and with truly high-density seating configuration.

How? By what we like to call the Airbus. The word "coach" has a negative connotation to many people. In some instances social status has a lot to do with it. The words "economy," "bargain," and even "tourist" are inadequate or inappropriate to most travelers.

The word "bus" has no such negative connotation, in our opinion. Airbus means what it says, a bus in the air.

Aircraft seat manufacturers are busy designing light-weight non-reclining seat combinations which offer an amazing range of possibilities for an Airbus service. Recently we tried out one of the new seats built by Burns Aero Seat Co., and we think they're ideal for short-haul commuter or high-density routes. Burns calls them "Aerobus" seats, but we like the word "Airbus" although somebody may have nailed down that trade mark long ago.

These seats avoid the biggest defect of short-haul coach service today—the reclining back—which not only hogs space but costs in weight. They aren't for transcontinental service, to be sure, but they're ideal for anything up to three hours of flying for a bargain low fare.

High density? For real. Up to 40 passengers in a DC-3, up to 80 in a Convair 240, and up to 114 in a DC-6B. These new seats weigh but 11 pounds per passenger place, yet they are comfortable for a short or intermediate-range trip.

Every airline seems to consider maintenance of a high standard of service to be of the utmost importance regardless of fare. (Ever look at the fine quality seats in the coach section of a jet?). Such sales appeal is understandable: this is a highly competitive industry. But the result is a battle for high-fare customers, and there are only so many of these.

So we have a suggestion here, too. Why not set up a separate fleet of airplanes for Airbus service? Paint the exteriors in a different color. Make it clear that here is a distinctly different class of service, not to be confused with the superior higher-fare services. A service made for people who just want to travel 300 to 500 miles without coffee, champagne, meals, house organs or fancy tickets. A service made for those who have to travel a lot and who will switch from their automobiles because it's cheaper and the service is as regular as a bus.

We have a feeling that the industry has always approached coach service with timidity. The goal is low-fare service but the end result is always on the plush side. Why be afraid to offer a truly spartan, completely frill-less service at fares low enough to tap the bigger market? Not everybody wants to pay—or can afford to pay—for Pullman.

Wayne W. Parrish

NOW IN SERVICE!

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. . . now flying on United Air Lines routes and soon to enter service with American Airlines, brings jet-travel speed and comfort to more cities. Later the 720 will go into service with Braniff, Irish, Lufthansa and Western air lines.

The superb 720 operates easily from shorter runways, yet cruises at more than 600 miles an hour. It's sleek, roomy and wonderfully comfortable . . . with the exceptional passenger appeal demonstrated by Boeing jets in service.

BOEING 720

Quesada Agrees

To the Editor:

I am heartily in agreement with the thoughts expressed in *AIRLIFT's* June editorial.

It is healthy for all of us to bring these problems to public attention in order that all segments of the U.S. aviation industry may realize the importance of continuing support for research and development with respect to manned aircraft. I share your view that our country must strive to hold its pre-eminent world position in aeronautical development and aviation safety, while at the same time recognizing the urgency and importance of the space race.

Since the establishment of the Federal Aviation Agency, we have discussed on a number of occasions with appropriate representatives of the National Aeronautics and Space Administration the need for a continuing program of basic research in the manned aircraft field. Approximately 25 to 30 per cent of their current research budget is devoted to basic aeronautical research, and with adequate support from the aviation industry, I feel assured that NASA will continue their efforts at about this level.

The FAA will strongly support NASA's aeronautical research program; however, I feel that vigorous support from the aviation industry is also required and you can play an important part in bringing this fact to industry's attention.

FAA is going to pursue an aeronautical development program at the National Aviation Facilities Experimental Center responsive to national needs with emphasis on projects that will make the greatest contributions in the improvement of safety. We have close coordination with NASA in the preparation of our own development program. Our objective is to bridge the gap between basic research and practical application in areas having broad safety significance. Of course we will avoid any duplication of effort.

The FAA is keenly aware of the challenge to the U.S. aviation industry posed by the supersonic transport. It is vital to the national economy and U.S. prestige that our country should be first to develop and produce a safe and economically competitive supersonic commercial transport. Close cooperation between Government and industry will be required to achieve this objective. We have been studying this matter for some time and are pursuing it vigorously.

NASA has a substantial basic research program directly related to fundamental problems associated with the development of a supersonic transport. The military services have a number of programs in progress designed to solve many of the problems associated with development and operation of large manned supersonic aircraft. The aircraft manufacturers are devoting a great deal of effort to preliminary design studies.

Our interest in the supersonic transport is twofold. First, we are taking the leadership to prepare a program to provide the Government sponsorship necessary to facilitate the development of a supersonic transport by U.S. industry. The objective of this program is to maintain the present U.S. leadership in the production and operation of safe and economically efficient commercial transport aircraft.

Secondly, we must assure timely preparation of regulations and procedures relating to certification and operation of these aircraft as well as provide for necessary progress in the fields of air navigation and air traffic control. FAA is working closely with NASA, the military services and industry in this endeavor.

You are well aware, I am sure, of our position and efforts in the area of air cargo. These efforts are bearing fruit and I am encouraged by the progress being made. FAA's interest in this area will continue unabated.

The military services, particularly the Army, are giving a great deal of impetus and support to the development of V/STOL aircraft. NASA has a current program of basic research in this field. We firmly believe this research and development activity will lead to expanded usage of V/STOL aircraft in civil aviation. FAA has both development and planning projects under way in this area.

In summary, FAA fully recognizes and firmly believes in the importance of manned aircraft to the future of our country and the world. We have statutory responsibilities for fostering and developing aviation and air commerce that we are keenly aware of and intend to pursue in the national interest. It is reassuring to know that you and other responsible publications will endeavor to keep the many segments of our aviation industry alert to the need for continuing support of aeronautical research and development.

E. R. QUESADA
Administrator, FAA
Washington, D.C.

No Panacea for Cargo

To the Editor:

Your editorial under the "Personal View" byline in the June issue of *AIRLIFT* was read with more than mere passing interest. The latter part of your article pertaining to cargo airplane requirements was particularly apropos and extremely well stated. How long is the aviation industry to continue to delude itself that a single cargo aircraft is the panacea for their existing ailments?

You will recall, over a decade ago during the air freight conference in Berkeley, sponsored by the Port of Oakland. Your statements pertaining to air cargo still hold true today. In fact, your talk need only be redated to fit a majority of our present problems.

It is hoped that formation of the recent DOD Ad Hoc Committee for Cargo Aircraft Requirements may lend some semblance of practicality to the problem.

L. R. HACKNEY
Hackney Airlift Associates, Inc.
San Gabriel, Calif.

In Defense of 'PERSONNEL'

To the Editor:

Congratulations to Mr. Kayser for his excellent article *Don't Sell 'Personnel' Down the River* (*AIRLIFT*, July, 1960) on a number of vital issues concerning the airline industry. The subject of personnel is of extreme importance and his article "hit the nail on the head."

Personnel selection in all categories and proper general employe attitudes are the few hopes for an industry legally squeezed on all sides with restrictive tariff and labor legislation.

I feel that this article is of sufficient importance to warrant thorough study of all who work for airlines whether they be top management or general employes.

Being a stockholder and employe of an airline myself, I am aware of the truth of Mr. Kayser's article and therefore wish to express my appreciation to Mr. Kayser for having so well expressed these vital points.

The above opinions expressed are my own and do not necessarily represent the attitudes or policy of Pacific Air Lines, Inc. This is a statement of personal opinions.

STEPHEN W. CAREY 4TH
Agent, Pacific Air Lines, Inc.
Oxnard, California

When & Where

AUGUST

Aug. 1-3—Institute of Radio Engineers, U.S. Army Signal Corps, 4th global communications symposium, Statler-Hilton Hotel, Washington, D.C.

Aug. 1-3—Institute of the Aeronautical Sciences, "Future of Manned Military Aircraft" (Classified), El Cortez Hotel, San Diego.

Aug. 5—Air Line Dispatchers International, safety forum, Washington, D.C.

Aug. 7-8—Army Aviation Association of America, 2nd annual meeting, Sheraton Park Hotel, Washington, D.C.

Aug. 8-12—American Institute of Electrical Engineers, 1960 Pacific general meeting, El Cortez Hotel, San Diego.

Aug. 16-17—Air Freight Cartage Conference, sponsored by Air Cargo, Inc., Edgewater Beach Hotel, Chicago.

Aug. 22-24—Airlines Electronic Engineering Committee, Sheraton Mt. Royal, Montreal, Canada.

Aug. 23-26—Institute of Radio Engineers, Western Electronic Show and Convention, Ambassador Hotel, Los Angeles.

Aug. 24-26—Advisory Group for Aeronautical Research and Development, NATO, Combustion and propulsion panel, Pasadena, Calif.

Aug. 28-Sept. 5—National Aeronautic Association, 1960 national air rally, Municipal Airport, Orange, Mass.

SEPTEMBER

Sept. 5-11—Society of British Aircraft Constructors 1960 Farnborough flying display and exhibition, Farnborough, England.

Sept. 6-16—Production Engineering Show, Navy Pier, Chicago.

Sept. 6-24—ICAO, legal committee, 13th session, Montreal.

Sept. 8-9—Engine and Operations Symposium, Airwork Corp., Millville, N.J.

Sept. 12—IATA, 16th annual general meeting, Copenhagen, Denmark.

Sept. 12—IATA, traffic conference 1, Cannes, France.

Sept. 12-16—International Council of the Aeronautical Sciences, 2nd congress, Eidg. Technische Hochschule, Zurich, Switzerland.

Sept. 14-16—National Association of State Aviation Officials, annual meeting, Wort Hotel, Jackson, Wyoming.

Sept. 20—IATA, composite and joint meeting of traffic conferences, Cannes, France.

Sept. 20-22—National Business Aircraft Association, annual meeting, Ambassador Hotel, Los Angeles.

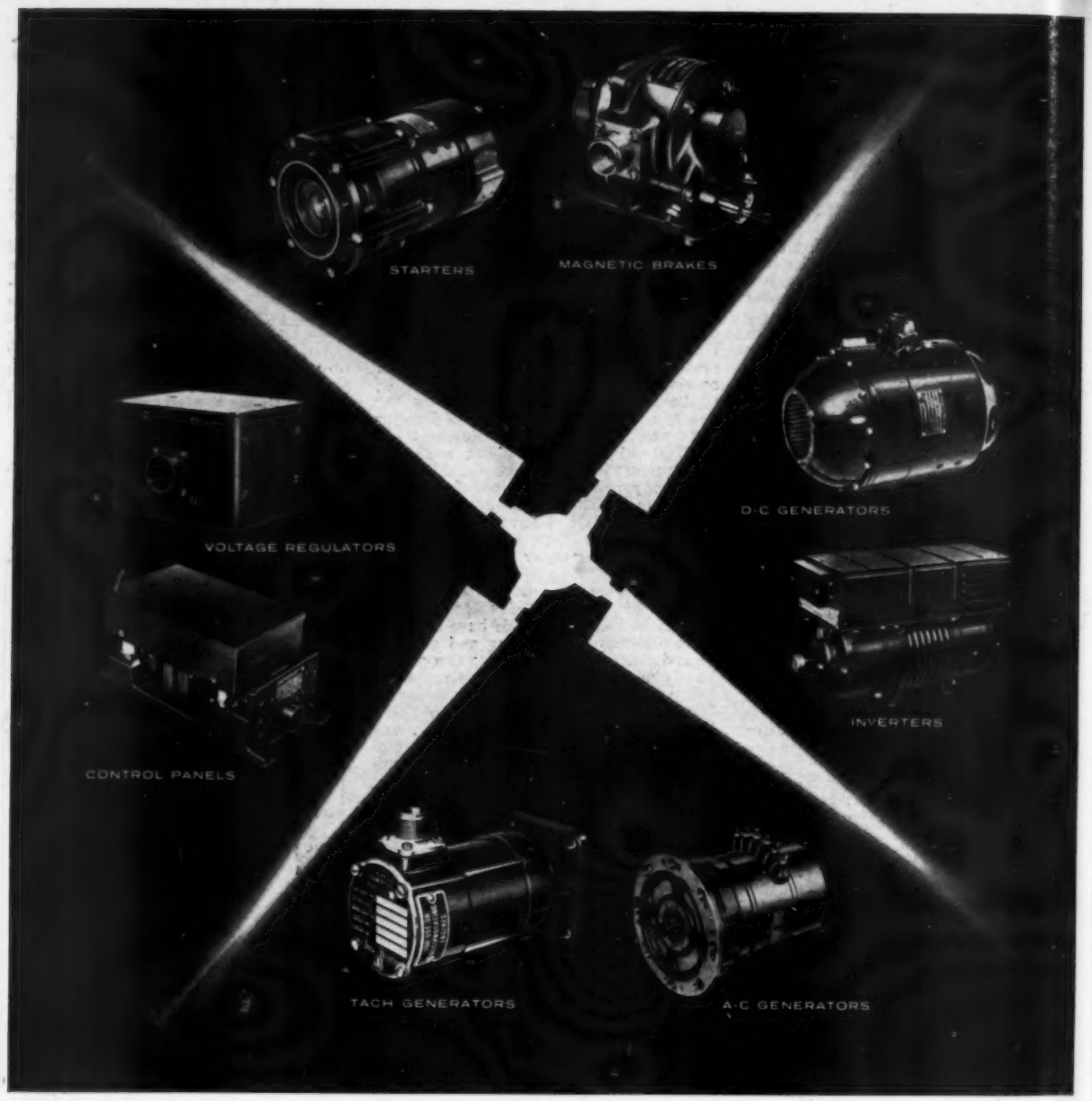
Sept. 21-25—Air Force Association, national convention and aerospace panorama, Civic Auditorium and Brooks Hall, San Francisco.

Sept. 25-27—International Northwest Aviation Council, 24th annual convention, Harrison Hot Springs, British Columbia.

Sept. 25-28—National Association of Travel Organizations, annual meeting, Cavalier Club, Virginia Beach, Va.

Sept. 26-Oct. 7—International Labor Organization, civil aviation meeting, Geneva.

Sept. 29-Oct. 3—American Society of Travel Writers, annual meeting, Williamsburg, Va.



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Air Transport Trends

Purchasing

Industry crackdown on suppliers is coming. First attack, leveled at a prominent west coast valve maker, will set the pattern. There will be others. Airline "analysis team," composed of strong membership from three or four carriers, will visit factories, shape up delinquent suppliers.

FAA

Don't do business with FAA. That's becoming the policy with more than one front-line electronics producer toward FAA R&D contracts. You can't win, they say. Proposal costs are getting out of hand. And if you get the business, it's virtually impossible to meet final specs by the time FAA field inspection people get through interpreting them. Some say "sour grapes." But the situation isn't good, getting worse.

Politics

Don't overlook James M. Landis if Democrats win. The former CAB chairman may be an influence in transportation matters. He's long-time legal advisor to Kennedy family, reportedly is working for Sen. John Kennedy on how to solve commuter transportation problems.

Equipment

Convair 540 costs look good. After nine months operation, Allegheny Airlines says 52-passenger turboprop shows cost per available seat-mile of 1.8¢, breakeven load factor of 14 passengers to meet direct costs over stage lengths of 178 miles maximum. Total direct operating cost of Napier Eland-powered transport is 95.36¢ per aircraft revenue mile.

New obstacle to surplus sales: high cargo conversion costs. Pricetag of about $250,000 per plane must drop to roughly $100,000 to widen market, would-be sellers report. Their suggested cure: manufacturers should release engineering for structural reworks, making lower cost conversions possible, particularly in foreign airline markets.

Airports

Insurance rates are skyrocketing. Airport managements have been jolted by big increase in liability insurance—in some cases two or three times previous premiums. American Assn. of Airport Executives opposes insurance companies' practice of lumping liability in with hull insurance.

Subsidy

More trouble for locals in Congress. Some lawmakers will object to new 12.75% rate of return on investment local lines will receive in final mail rates. House-Senate report warned that increased subsidy trend must be reversed, prodded CAB to scrutinize carriers' "administrative costs and allowances." Some Congressmen even objected to former 9.5% return.

Liquor Aloft

New airline code may head off legislation. Ten trunks signed pact limiting a passenger to four ounces of liquor, 26 ounces of wine or two cans of beer. Air Traffic Conference will police agreement. Western didn't sign because of champagne service. United will comply but isn't a party because WAL is a competitor. Industry hopes agreement will keep no-drinking bills from reaching floor in Congress.

DELTA'S CONVAIR 880 JET

LIVING ROOM COMFORT AT 615 MPH—You're looking down on the spacious club compartment, as found in Delta's new Convair 880, Champion of the Jets. Here you'll find a quiet luxury you've never known before in travel...with flight time so brief that half the nation has now become one community.

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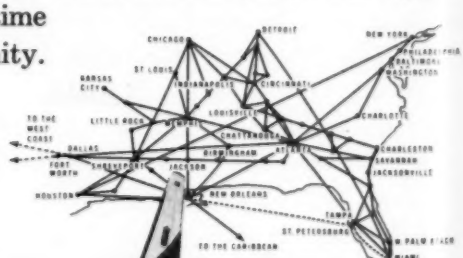

Delta operates *both* the Convair 880 and the magnificent Douglas DC-8, linking important cities throughout the eastern half of the U.S. with the finest in modern air transportation.

Industry at a Glance

NEW EQUIPMENT

Pace of new orders quickens. It adds about $140 million to manufacturer's new business. United signed a $45-million letter of intent for 11 Boeing 720s, Pan Am ordered three 707-321s and Western said it will buy a fourth 720B.

Contributing to the total were 720B orders from Avianca Colombian airline (2) at $13.5 million and Ethiopian Airlines (2) subject to financing approval. El Al Israel ordered two 707s and optioned a third, while Alaska signed up for one Convair 880-22M.

Outside the U.S., deHavilland drew one Comet 4B order from BEA and Sud Aviation three orders for nine Caravelles: Air France (3), Alitalia (4) and Air Algerie (2). Riddle Airlines' $4.9 million USAF contract confirmed its order for five Armstrong-Whitworth Argosies, due to enter service between December and February. British government upped its Argosy order to 40.

On the resale scene, Air France sells three Viscounts to British charter operator Mailand Drewery. Mohawk will dispose of its DC-3 by Jan. 1, 1962. Capital cancels tentative commitment for five Lockheed Electras. Congress kills $10 million pegged for military F-27s.

On the horizon, United says its order for Boeing 727s is only weeks away . . . FAA plans to order an 880, 720 and Electra to modernize its fleet. This leaves only Douglas with no FAA business. Air India will order several more 707s.

SUPERSONICS

A profitable Mach 3 jet, derived by minimum adaptation of the B-70, could fly in 1967, according to Senate Preparedness subcommittee. It would carry 80 first-class or 108 tourist passengers, cruising at 1,980 mph at 70,000 ft. Cargo version would handle 75,000 lbs. over 2,479 n. mi. or 36,000 lbs. for 2,930 n. mi.

Operating cost would be 2.5¢ per seat mile for domestic transcontinental and 2.75¢ transatlantic based on 3,000 hrs. annual utility; 90-mixed-class passengers; and JP-6 type fuel costs of 16-18.5¢ per gallon. Engines would be non-after burning derivatives of GE J93.

ENGINEERING/OPERATIONS

Much-needed revision to 1955 ATA formula (for comparing transport operating costs) is available. Write ATA Engineering Div., 1000 Connecticut Ave. NW, Washington 6, D.C. for copies of "1960 ATA Formula."

Evaluation of radically-new "Glide-Aire" system to speed baggage handling is underway at Kansas City by TWA. System is joint development of TWA and Douglas, uses a hose line from jeep-mounted compressor to pump air into Glide-Aire pads at base of each container. Containers are crescent-shaped to fit fuselage contour and glide along conveyor belt into aircraft.

ATC/COM/NAVAIDS

Most tangible new addition to nation's ATC network is taking shape via $11 million FAA order that will place ASR-4 airport surveillance radars at 34 locations. Program takes in such points as Orlando and Tulsa, Toledo and Little Rock, provides coverage for 60 miles to altitude of 25,000 ft. Contract belongs to Texas Instruments, Inc., Dallas, new supplier of civil radar.

Project 2000 is Air Traffic Control Assn.'s long-range study of two-way data link systems for future air-ground-air communication. ATCA hopes to report results at its San Francisco convention Oct. 3-5.

Push to develop lightweight ATC radar beacon transponder gains ground as FAA selects Hazeltine (Indianapolis) and Wilcox (Kansas City) to come up with prototypes weighing about 14 lbs. and costing about $1,000 in production. Delivery: one year.

New standard for manufacture of air transport instruments and indicators is official. Arinc's Airlines Electronic Committee Spec. No. 408 has all the details (weights, dimensions, square instead of cylindrical case, etc). Write Arinc, 1700 K St. NW, Washington 6, D.C. for copies at $1 each.

Order for 20 distance measuring equipment (DME) units by FAA from IT&T's Federal Division (Clifton, N.J.) makes available first "Tacan compatible" ground units. FAA contract stipulates that other prospective buyers have right to buy for one year at prices set from $32,666 to $36,434 depending on quantity.

AIR CARGO

First of six TWA 1649As heads for Lockheed Aircraft Service-Ontario, Calif. this month for conversion to cargo service. Project calls for a fuselage beef-up, cargo flooring and tiedowns, a 57-in. wide by 71-in. high forward door and 106.5 by 74-in. aft door. This brings LAS conversion total to 27. TWA contract is worth $1.5 million or an average $260,000 per aircraft.

Industry at a Glance

Timetable is set for Air Force plan to order optimum MATS cargo plane. Call for proposals will come shortly after Aug. 15, followed by conference with potential bidders. Source Selection Board will get narrowed-down list of proposals shortly after Oct. 1. Successful prime contractor will be named late in December and contract negotiations will start by Jan. 1, 1961. Aircraft must be operational by Fiscal 1964.

AIRCRAFT SERVICES

Southwest Airmotive, Inc., Dallas, can now boast of three airline customers for P&W JT4 jet overhaul—Braniff, National and Eastern. Its rate is up to one jet overhaul a day. SAC, incidentally, is marking its 5th anniversary overhauling jets, mostly Allison J33s for USAF.

Long-term service agreement between New York Airways and General Electric's Small Aircraft Engine Dept. (Lynn, Mass.) provides for GE maintenance of CT58 turbines in NYA's Vertol 107 due to enter service next year. GE shop will be located at Linden, N.J.

FAA

Rule requiring mandatory installation of flight recorders in all airline turbine aircraft is official. Deadline is November 1, but extensions for good cause may be had until May 1, 1961—no later.

New FAA booklet "Noise Abatement Procedures" on its way to industry sets standards for operating jets and turboprops during takeoff, climb, approach and landing.

Two new turbines are now approved—Boeing's 720 and Sikorsky's S-62 helicopter. Maximum altitude on Convair 880 was upped to 41,000 ft.

LABOR

After an uneventful 1959 on the labor front, airlines are finding 1960 almost a replica of the troubled times of two years ago.

Southern Airways' pilot strike, in its eighth week, was raising the explosive question of whether ALPA pilots on other airlines would observe picket lines set up by Southern crewmen. The move, authorized by ALPA but not yet put into effect at presstime, would hit operations of airlines in 13 southern cities. Pay and working conditions are the issues.

Over 50 non-union pilots restored Southern's service to 16 of 41 cities and the airline planned to hire more. Returning ALPA members will be below non-union pilots on the seniority list.

Elsewhere, flight engineers' walkout continued to harass but not cripple Continental. Strikers were replaced by second officers. FEIA claimed CAL seeks to replace engineers with engineer-trained pilots.

Northwest and ALPA are tangling. A few flights were disrupted when ALPA refused to man jets because the third man in the cockpit was not an ALPA member. NWA engineers are not pilot-trained. A strike is not planned soon.

"Illness" hit TWA stewardesses and pursers disappointed over arbitration decision on jet wages and hours. No service disruptions; absences subsided.

AIRLINES

Interline baggage survey by Air Traffic Conference will seek ways to better luggage transfer between carriers. Eight major cities will be involved . . . **Allegheny Airlines** no longer requires reconfirmation of return reservations . . . **Piedmont** is new member of Assn. of Local Transport Airlines bringing its roster to 16 . . . **Aerolineas Ini y Cia,** private Argentinian airline, is now an active member of Int'l Air Transport Assn. . . . **Trans-Caribbean** is dropping its associate IATA membership . . . **Trans Australian Airways** is not for sale, says Civil Aviation Minister Senator Paltridge, in scotching charges to this effect by opposition members in Parliament.

SIDELINES

Leonard W. Jurden, 34-year CAA and FAA veteran, retires in Kansas City August 5 . . . **E. H. "Ed" Heinemann,** 52, a top engineer at Douglas for 24 years, resigns to accept post of exec. v.p. with Summers Gyroscope Co. . . . **Regina Cargo Airlines,** a supplemental, changes its name to Imperial Airlines . . .

With no ceremony whatever, American Airlines is changing signals—will call Boeing 720 the "720" and not the 707-023 it originally chose . . . **Braniff's** R. V. Carleton cops the spotlight at recent ATA Operations conference with his introduction of FAA Administrator Quesada. When FAA was formed, said R. V., everybody was asking "Who is this guy Quesada?" Now they're asking, "Who does this guy Quesada think he is? **Congratulations** to Douglas on its July 20 anniversary. Its 40-year output of 41,200 planes and 32,000 missiles is a long pull from that back office of a Pico Blvd., (Los Angeles) barbershop on July 20, 1920.

PROBLEMS? OR PROFITS?

Route pattern complexities of typical airlines demand a cargo aircraft with the capability of operating over both short and long route segments with excellent economy and earning ability. The Canadair Forty Four will do this for you! It combines the air cargo feeder liner with the long range aircraft to provide a standardized economic fleet unit. The Forty Four will give you profit-making operations, at current rates, over route segments as short as 200 miles and as long as 4,000 miles.

This is the type of flexibility that will answer the many and varied problems confronting airline operators who, because of the growing demands of shippers, are being forced to provide a combination of short, medium and long range air cargo services for the carriage of freight at attractive and competitive tariffs. In this situation, the Canadair Forty Four offers excellent economy and earning ability over the complete range of route structures that must be provided in the collection and distribution of air cargo.

Practical applications of this are found in the short route cargo services that are necessary in the supply and distribution of goods to or from the terminal points of transcontinental and trans-Atlantic services. This is evident between the major cities of the Eastern United States and between the principal points of Europe. These inter-city runs are essential extensions to the long haul trunk service, and with the Forty Four can be handled without a change of aircraft.

The need for this system of short, medium or long range operations will develop through the growing awareness among business establishments that the carriage of articles by air is becoming an essential element in the overall marketing function. This will open up new markets, new transportation requirements, new inter-city services. The Forty Four, with its flexibility of performance, can carry cargo at a profit over the whole distance spectrum—short, medium and long range, and has the airfield performance characteristics to get in and out of 85% of the world's major airports. THESE ARE DECISIVE ADVANTAGES IN FAVOR OF THE FORTY FOUR.

SOME RUNWAY AND PAYLOAD SPECIFICS ON THE FORTY FOUR-D4

1. From runways as short as 6,000 feet, can operate with 70% payload up to stage distances of 3,000 miles.
2. Can operate from 85% of the world's major airports, with due consideration to both runway length and allowable wheel loading.
3. Will earn an operating profit with load factors as low as 30%.
4. Breakeven load factors in the Forty Four represent loss loads on larger proposed equipment.
5. Breakeven load factors on larger proposed equipment represent major profit payloads on the Forty Four.
6. Can operate *non-stop* on the London-New York route with an average annual payload of over 55,000 lbs.

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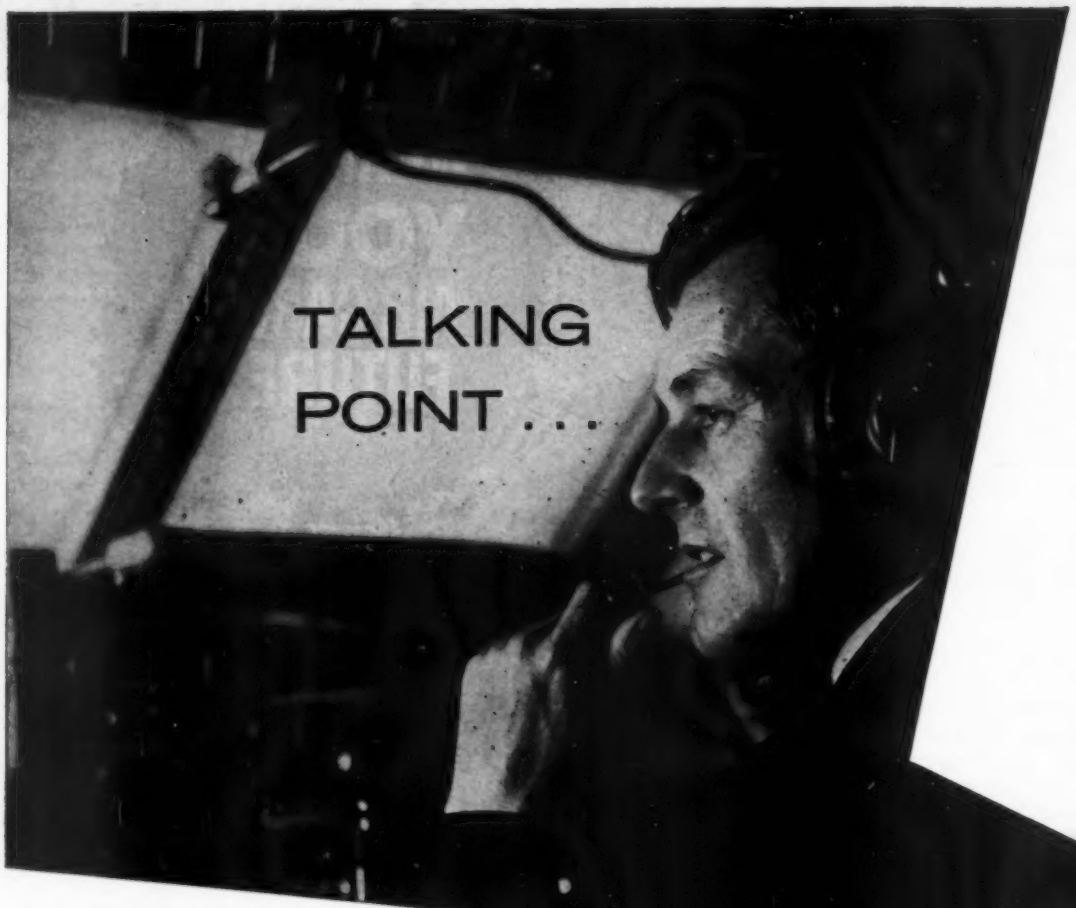

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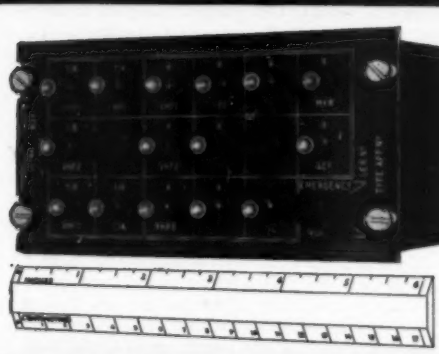

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Do Small Trunks Have to Merge?

In response to an exclusive *AIRLIFT* survey, four out of seven regional presidents say 'No', unequivocally

We Asked the Questions

The whole industry is talking merger. And without exception, the target is the smaller trunks.

Do they have an economic future? Will there be room for only six or seven big trunks? Can a well-managed regional airline survive? How?

No one should know the answers better than the people who run these airlines today. AIRLIFT put the questions directly to their presidents and four out of seven had some pointed answers.

Braniff's C. E. Beard declined to comment because "we have not felt that merger was essential to our economic existence." Capital's present financial dilemma precluded a statement by its president David H. Baker. Northeast was not queried because of its pending consolidation with TWA.

Other Questions Bounced Back

Without naming names, some bounced back other questions. Have financial woes been the experience of only the regional carriers? Have industry earnings been such as to hold forth any promise of profit through "rescue" mergers?

If regional trunks quietly and successfully financed present jets (despite claims it couldn't be done), could they not repeat the performance?

Isn't it fair to objectively examine the statements of those who predict elimination of smaller trunks for elements of self-serving, empire-building propaganda.

Isn't today's excess competition primarily a result of the big competing with the big?

Good questions. And some good answers were forthcoming from the heads of Continental, Delta, National and Western. Here they are, not necessarily in that order.

Robert F. Six
President, Continental Air Lines

I THINK IT'S HIGHLY POSSIBLE—even probable—that there will be some change in the industry corporate line-up in the next few years. However, regional carriers like Continental not only can survive, but can continue to grow, and grow profitably, if they use their greater flexibility to provide better service and better operational dependability, and if they continue to aggressively merchandise their product, but most important of all, if they keep their costs in line. Costs are the essential element to both survival and profit in the jet age.

Continental's costs are low because we've worked to keep them that way. Our indirect expenses are only 87 per cent of our direct operating costs. High utilization (12 hours, 45 minutes per day per plane) has kept our break-even load factor for our Golden Jet Boeing 707s at 42.5 per cent, while break-even on our jet-powered Viscount IIs is only 44 per cent. And, these two aircraft produce almost 85 per cent of our daily seat miles.

The Civil Aeronautics Board can help keep the regional trunks financially sound by maintaining a sensible fare structure; by transferring smaller cities, which the regional trunks serve at a loss, to the routes of local service carriers; by continuing to strengthen the regional trunks through new route awards—not awards which add too many carriers merely for the appearance of unlimited competition, but awards which make available to the traveling public a service geared to local markets by regional carriers.

The Board's policies, growth and health of the national economy, availability of financing and the ability of airline managements to keep costs down and to merchandise their products ultimately will determine the number of trunk carriers in the country.

Terrell C. Drinkwater
President, Western Air Lines

DURING THE PAST TWO OR THREE YEARS, there seems to have developed an opinion, widely held in some quarters, including the financial community, that for the airline industry, mergers are good *per se*. This attitude has almost reached the hypnotic force of a constantly repeated slogan. Many people appear to believe that mergers are good for all concerned just because they are mergers, and that when an airline gets into difficulty a merger is the panacea. I believe this view to be superficial.

Certainly some, but not all, mergers are good. Some would be very bad, for a variety of reasons. In addition to the public service aspect of the question, one test that is frequently overlooked by merger advocates is whether a proposed merger will result in longterm benefits for the stockholders.

In certain hypothetical cases the shareholders of the company in distress might conceivably benefit from a merger which, at the same time, could well result in dilution of benefits to the shareholders of the healthy merging company or companies. In any event, it is difficult to find anything in our basic regulatory law adopted in 1938, in its legislative history, or in the cases decided by the Civil Aeronautics Board and the federal courts since that date which indicates any intention or plan that there ultimately be only six or seven trunk carriers in our industry.

The clamor for mergers is, I believe, a direct result of excessive competition, in most instances, and misguided certifications. In my judgment, the applicant airlines, several over-zealous cities and chambers of commerce, and the CAB are jointly responsible for this present situation. I hasten to add that Western pleads "not guilty."

Since 1947, Western has adhered constantly to its position and its limited ambition of becoming and remaining

Six: "Regional carriers can not only survive, but can continue to grow . . ."

a strong regional airline serving only the western portion of the United States.

Furthermore, in recent years, with only one exception, Western has not filed an application for a new route on which there was more than one trunkline operating at the time the application was filed. The single exception is our pending application to provide service between several cities on the mainland and the new State of Hawaii. In this one instance, Western's proposal seeks routes which will only partially parallel the existing service offered by two of the world's largest airlines, but, in addition and in combination, this same application offers to provide much-needed and entirely new one-plane service to Hawaii.

Further, on the question of excessive competition, if anyone will take the trouble to analyze carefully the general composition of the trunkline systems today and the history and development of these separate systems since 1938, one will find that the much-referred-to policy of "strengthening the weak carriers" is somewhat of a myth. Such an analysis will disclose that the overpowering dominance of the Big Five airlines—American, Eastern, Northwest, TWA and United—has remained at substantially the same level of supremacy for about the last twenty years.

Small carriers suffer

In Western's case, for instance, we carried, in 1938, 2.5% of the total revenue passenger miles flown by the domestic passenger trunklines. In 1960, our participation is at about the rate of 2.8%. The reason for this is that, in most Civil Aeronautics Board cases wherein smaller carriers have been granted new routes, one will find, almost inevitably, that one or more of the Big Five in the same cases has been given a route or routes of a long-haul and high-density nature, which, on balance, adds much more strength to those of the Big Five participating than the corresponding strength given the small carrier.

Most of the excessive competition so far has been brought about by airline applications and CAB action on these applications in the eastern part of the United States. Everyone involved seems now to agree—both in industry and government—that this has been a bad mistake in policy. We are most hopeful that this same mistake of traffic dilution will not be duplicated in the western part of the country. We are, however, quite alarmed at the suggestion of the examiner in the Southern Transcontinental case.

If the Civil Aeronautics Board should be so unwise as to adopt the examiner's recommendations we would be confronted with the sorry spectacle of seven airlines operating between Los Angeles and San Francisco, seven carriers between Los Angeles and San Diego, five between Los Angeles and Phoenix, five between San Diego and Phoenix, and five between San Diego and San Francisco.

With the advent of jet operations, the disparity in long-haul route awards becomes even more important. (Significantly, in this regard Western is the only domestic trunkline which does not have access to a single one of the top one hundred passenger traffic density segments of 1,000 miles or more). It is hardly necessary to re-state the obvious point—that large jets are only economically feasible when operated over reasonably long stage-lengths. Primarily for competitive reasons, Western, on June 1, 1960, inaugurated Boeing 707 jet service between major cities on the coast.

This coastal operation permits Western an average stage-length for its jet operations of only 589 miles. This is about two-and-one-half times shorter than the average stage-length of jet operations enjoyed by our principal competitor, and is approximately one-half the stage-length of the average domestic jet operation of all jet airlines today. This fact, incidentally, was one of the basic reasons why it was absolutely essential for Western to seek long-haul jet routes by applications for routes to Hawaii and between California and Texas, so that we might be in a position to attain an average jet stage-length over our entire Western system which will be economically sound.

Proud of Western's record

All of us charged with the management of Western Air Lines are, we think justifiably, proud of the company's record over the past ten years. Although we have been seriously hampered by two unduly long strikes, we have, nevertheless, been able to operate profitably, to provide good service with modern equipment, and to maintain an unbroken record of cash dividends to our shareholders for the past ten years and stock dividends for the past five years. We have been able to constantly carry down to net a higher percentage of our gross revenues than most air-

Drinkwater: "The clamor for mergers is . . . a direct result of excessive competition . . ."

lines and have, moreover, been able to maintain one of the lowest break-even load factors for several years.

These accomplishments, however, have on numerous occasions been emphasized by competitors for route awards as reasons why Western should not be strengthened. These competitors have suggested that Western should be penalized because of its success, modest though that success may have been. Some have even gone so far as to urge the point that in a given route case the most unsuccessful, poorly managed and most constant loser in the profit column should be awarded the routes sought after. This doctrine of awarding premiums for failure we regard as shameful, and hope that it will not be countenanced by the CAB.

I am convinced that there is nothing wrong with our industry today that wise management decisions and careful, judicious and farsighted administration by the CAB will not cure. It is very popular today for writers and speakers to hold forth at some length on the subject of what's wrong with the airlines. It would indeed be refreshing to have someone come forward and speak up about what's right with the airlines. There is much that has been unsaid.

G. T. Baker
President, National Airlines

AS FAR BACK AS I CAN REMEMBER, there have been talks of mergers in the airline industry—and very

few ever were consummated. The chief reason for lack of progress in this phase of our industry is obvious. The red tape, rules and regulations involved in mergers delay a final conclusion for years, during which time the employes of one or the other—or maybe both—of the companies reach a low level of morale and interest in their jobs.

If you and I each owned a grocery store, we could sit down and in an hour or two agree on a merger and complete it the following morning. No one would be looking over our shoulders, ever ready to direct, criticize, misinterpret, turn and twist our motives, upon circumstantial, unsubstantiated evidence.

I do not know how many trunk carriers, regional trunks,

Baker: "The red tape . . . involved in mergers delays a final conclusion for years . . ."

feeders or cargo carriers will be required adequately to serve the traffic demands of the country. Theoretically, at least, without giving consideration to the effect of such a monopoly, one carrier serving the domestic United States and another serving the rest of the world could probably do a pretty good job; and I am sure anyone familiar with this industry could select the two companies who would like to obtain such a franchise.

The large, life-size bugaboo today is too much competition in markets which cannot support it. There are many examples one could cite, but Tampa is an interesting one. A few years ago, two carriers served Tampa; today there are nine, with an average load factor through Tampa of approximately 25 per cent. The thinking in this business, in many quarters, is still tied to the Ford Tri-Motor age, including the procedures governing mergers presently required by the Civil Aeronautics Act.

A well-managed airline, whether it is a trunk, regional trunk, feeder, or cargo carrier, can survive economically and operate profitable if it has a proper route structure not overburdened with unnecessary competition, and regulatory directives and decrees prompted by inexperience.

C. E. Woolman
President, Delta Air Lines

I AM CONVINCED that, with the right economic and regulatory atmosphere, the majority of the well-managed smaller trunklines can survive.

Let me emphasize the reasons for my use of the phrase "smaller trunklines". The passage of time and the development of the industry has pretty well eliminated the "regional trunkline" category of carrier. Unless we consider an area as large as one-half of the continental United States as a "region", obviously carriers such as Capital, Continental, Braniff and Western, all of which run from the Midwest to either the East or the West Coast, are no longer "regional".

As to the "inevitability" of mergers, certainly no broad, all-inclusive rule can be laid down on this subject, and those who would do so undoubtedly have a selfish ax to grind. Certainly sound mergers can be good and constructive, but merger for the pure sake of merger can prolong an uneconomic situation, rather than solve the basic problem, and in the end the stockholder of the acquiring line will pay the cost of someone else's original mistake.

I believe that we have gone too far down the path of "competition for competition's sake." In my opinion, in those markets which require—and can support—competition, the overwhelming bulk of the benefits involved are made available by first, effective competition. On the other hand, certification of a third, fourth or fifth carrier rarely produces significant further improvements in service for the traveling and shipping public.

Especially today, when the industry in general stands on a relatively shaky financial footing as we move farther and farther into jet aircraft development, the Board should make a very real effort to limit excessive competition in order that the true objectives of the original Civil Aeronautics Act and the more recent Federal Aviation Act can be achieved and maintained.

The recent, "press release" action in the General Passenger Fare Case—depending upon the nature of the Board's ultimate decision and its future attitude toward new pricing problems in our industry—foretells an improved regulatory climate in the rate field. The "new" Board's first major voting in the area of route awards, however, very likely will occur in the Southern Transcontinental Case. If that decision tends to strengthen the smaller trunk carriers without the imposition of improvident multiple-competitive awards, I see no reason to believe that the well-managed intermediate-size carriers cannot survive and they should be able to perform very useful and

Woolman: "I am convinced that . . . the majority of the well-managed small trunklines can survive."

important public services while earning fair returns on their stockholders' investments.

In his recent Initial Decision in the Southern Transcontinental Case, the C.A.B.'s Examiner Edward Stodola said:

". . . this last great frontier for airline expansion also represents perhaps the last great opportunity for some real regulatory statesmanship—i.e. action to reduce the tremendous disparities that now exist between the large and small carriers in the trunkline portion of the industry, a continuation of the Board's long-standing but too often neglected policy of strengthening the smaller carriers, and a discharge of the Congressional command to do what is necessary in the proceeding to help establish an economically sound and competitively balanced air transportation system.

"It is 'later than we think' in the economics of air transportation."

There is a great deal of importance, both to the smaller trunks and to the Board, in these few pithy conclusions. ■

SPOTLIGHT ON CLEAR AIR

When early jets first sought the upper reaches of the atmosphere, they soon ran afoul of a mystical, invisible force which could fling an aircraft across the heavens as effortlessly as if it were a feather. The poser was the baffling way that it could occur in clear weather. Today, after eight years of research, the problem is still very much an enigma.

By PHIL GERACI and DICK VAN OSTEN

AIR TURBULENCE

AN UNSEEN FORCE LURKING in the upper atmosphere is giving high altitude operators cause for concern by its penchant for tossing jet transports and military aircraft about the skies without warning. Bearing an unwieldy title—clear air turbulence—this invisible, treacherous and totally unreliable force shares a major part of the blame for the following incidents:

1. A Delta DC-8 flight in mid-May dived violently and unexpectedly from 10,000 ft., some 30 miles out of Miami. The toll: 11 of the 55 aboard injured, one requiring hospitalization. Flying conditions: clear.
2. A United Air Lines flight crossing the Rocky Mountains at altitude ran into such severe gusts that two passengers and two stewardesses were injured, the stewardesses critically. Flying conditions: clear.
3. An Air Force B-52 pilot, encountering turbulence in clear air near Butte, Montana, reported his 450,000-lb. aircraft "inverted" at 35,000 ft. Flying conditions: clear.
4. USAF pilots crossing the Andes in South America report such severe turbulence that seats are ripped from their moorings and rivets popped from their sockets. Flying conditions: still clear.
5. And a now historic tale—the crash of a Northwest Airlines Electra near Cannelton, Ind. last March 20—has been laid partly at the feet of turbulence which occurred in clear air above 13,000 ft. and which triggered an abnormal stress pattern which separated the wings from the fuselage.

What is not generally known is that potential turbulence in the Cannelton area was predicted by meteorologists of at least two airlines—Eastern and American—who urged pilots venturing into the troublespots to proceed with caution.

Statistics on the march

The record does not end here. Air Force reports of the phenomena are legion. The airlines are compiling an impressive record, based on pilot statistics. As more and more jet transports commence high altitude operation, the list of incidents will continue to grow.

What is this unseen force that arises apparently from nowhere and pounces upon unsuspecting jets without warning?

To find the answers, *AIRLIFT* went to the U. S. Weather Bureau in Washington, where high altitude forecaster Ralph James described the condition in these terms:

"Clear air turbulence actually falls into two major categories. The least predictable is that associated with the jet stream. It is the result of high wind shear, and usually occurs along the jet stream's northern edge."

Wind shear along the jet stream is due to strong winds near the center sliding past progressively weaker winds toward the outer edge. Over an area as narrow as 100 miles, winds may grow from 40 knots to 80 knots near the center of the jet stream. Faster winds sliding past slower ones set up a tumbling action—turbulence.

To the Weather Bureau, the second major type of clear air turbulence is considered a thing apart, and is not so designated despite its obvious effect on airplanes. This is the so-called "mountain wave" which exists whenever strong westerly winds crest a north-south mountain chain.

The condition is precipitated by squeezing of air masses aloft as eastward-blowing winds rise to clear the mountain peaks. Once past the peak, they surge downward onto the mass of placid currents in the valley below.

The conflict of strong westerlies with quiescent surface winds sets up a tumbling effect on the lee side of the mountain. The turbulence which results may extend upward to a considerable altitude.

The Weather Bureau has been conscious of high altitude clear air turbulence since early Air Force jets began venturing into the upper reaches of the atmosphere. But only recently—since commercial airlines began flying jets—have potentially turbulent clear air conditions been noted on weather maps.

No specific symbol

In fact, there is no specific symbol for clear air turbulence. The words are written out, sometimes abbreviated CLR AIR TRB, across the map in regions where rough air is predicted.

The Weather Bureau observes clear air turbulence just as it observes fronts, cloud covers and precipitation. Predictions are based on an analysis of wind speeds at high altitudes, secured through the use of radiosondes from scattered points across the globe.

The aircraft operator with the most experience in clear air turbulence is the U.S. Air Force, which has been sparring with high altitude turbulence since the early days of the B-29. The USAF has accumulated a wealth of data.

One thing the Air Force has found is the presence of sharp trough lines aloft which may produce turbulence. AF weather experts also point to the deep upper level cold low as another possible culprit.

The Air Force deems the mountain wave the toughest in its experience, describing an intensity as high as 4,000 ft./min. at very high levels.

Air Force weather experts early learned to recognize trouble in the thin, rolling "cap" cloud which often hugs a mountain top and flows down its leeward side. The hazard to low-flying aircraft is that it may disguise the crest. To aircraft flying at high altitudes it signifies potential turbulence as high as 100,000 ft. or more.

Air Force weathermen describe the mountain wave like this:

Above the cap cloud is the roll cloud, located near the peak of the vertical updrafts. The roll cloud may have a base below the peaks and may rise as high as 30,000 ft. In its trailing edge may lurk downdrafts of 5,000 ft./min.

Above the roll cloud is the lens-shaped or "lenticular" cloud. Smooth in shape, lenticulars may extend to beyond 40,000 ft. They usually are stationary, constantly forming to windward and dissipating to leeward. They may form as many as 10 tiers on a ridge's downwind side.

Formation spells danger

Topping this stack of ill omens may be the so-called "mother of pearl" cloud, a rare formation at 80,000 to 100,000 ft. This cloud can be seen long before the lower formations. To pilots it spells one thing: danger.

Unfortunately, not all mountain waves affix their signature with telltale clouds. A "dry wave" may be produced when there is insufficient moisture to form clouds. It's invisible, but every bit as turbulent.

Although mountain waves normally frequent the loftier ranges of the western U.S., evidence has been found elsewhere of waves up to 75,000 ft. existing over a row of hills a few hundred feet high.

Mountain waves are easier to predict than turbulence in the more fluid, roving jet stream. Turbulence in the jet

USAF Photo

Clue to mountain wave turbulence is this cloud formation, formed by rolling motion of air flow on leeward side.

stream is choppy. Gusts often exceed 40 ft./sec.

The jet stream weaves across the United States like a drunken snake. It moves up, down and sideways. It is a wide, flat ribbon, normally a few thousand feet thick. It is generally weaker in summer than in winter.

In cold air, it may dip as low as 20,000 ft. It may also rise to 40,000 ft. It is comprised of layers, each flowing at different speeds—thus the turbulence-producing "shear."

Turbulence is always greatest on the cold, or north, side. It comes as a series of hammer-like shocks, and is suspected of causing a considerable degree of metal fatigue.

Air Force weathermen feel that forecasts of jet stream turbulence would be facilitated by more frequent upper-air soundings. Emphasis, they feel, should be placed on soundings of high-speed winds. They are skeptical of the present use of radiosondes, feeling they are not sufficiently accurate since the low tracking angle induces error.

The airlines, too, feel that a more accurate means of forecasting clear air turbulence is needed.

To help illustrate the jet stream effect to his own clan, Pan American's chief meteorologist E. R. Buxton delights in showing a chicken-wire model which demonstrates how the jet stream rides at the confluence of a warm and cold air mass, capped by a clear plastic tropopause which he rests on top of a mass of cotton, representing clouds.

A cross-sectional view of the jet stream is also diagrammed in a booklet on meteorology published by the Atlantic Division for ground training.

Pan Am's approach may be exemplified by two questions from the end of the chapter on clear air turbulence:

1. Clear air turbulence encountered at 40,000 ft. can be avoided quicker by: (a. Lateral diversion? b. Change in altitude?)

2. At 30,000 ft. you encounter clear air turbulence. How would you attempt to avoid it? (a. By changing altitude? b. By changing direction?)

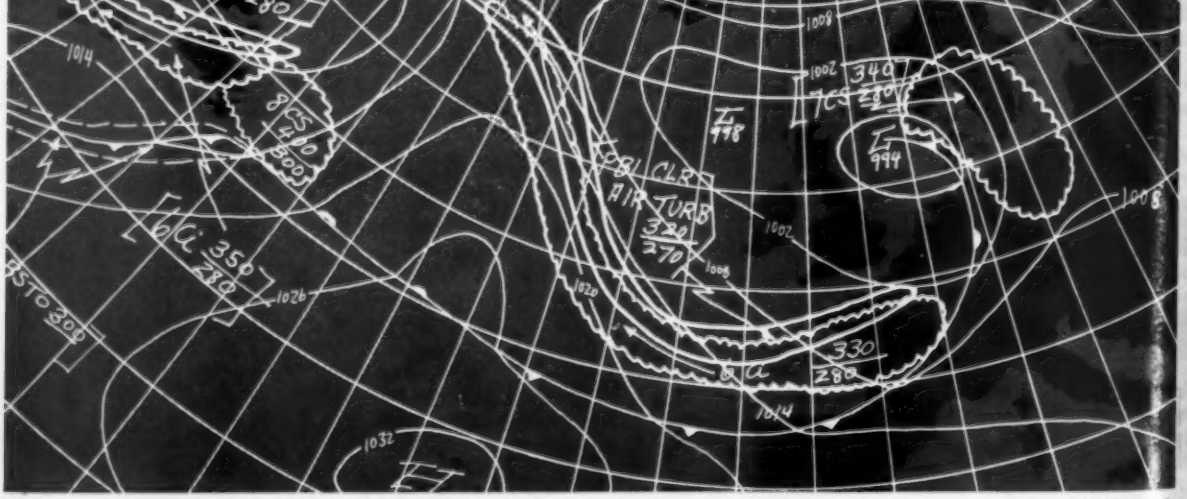
Problem not deemed drastic

Pan Am's manual with references to CAT appeared as early as 1956. Buxton feels the problem is not drastic. "We run into moderate turbulence regularly," he says, "but the incidences of severe turbulence are rare. Our pilots flight plan to avoid it wherever it shows up on a weather map, but if they find some that wasn't predicted, they simply slow down, call for belts, and sweat it out."

Pan Am's policy apparently has paid off. The airline has no record of injuries directly attributable to CAT.

At American, flying a multitude of routes along the unpredictable North American jet stream, the approach is a bit more vigorous, though the attitude is similar.

Chief Meteorologist A. F. Merewether says American's crews, too, would flight plan around an area threatened



AIRLIFT Drawing

Clear air turbulence over the North Atlantic is shown like this on maps prepared by weather analysts at Idlewild. Area of probable turbulence lies along northern edge of jet stream, is indicated on upper air weather charts by wiggly line.

by CAT. But if ATC clearance could not be obtained, the pilots would forge cautiously ahead.

The vigor in American's program takes the form of a compilation Merewether is making of pilot reports on CAT. He already has a healthy stack for the past six months, and it is growing daily.

American has suffered no injuries because of CAT. Like Pan Am, the domestic carrier finds cases of severe CAT rare, though moderate CAT crops up almost daily.

Merewether considers CAT more of a "nuisance" than a problem, but has not closed his mind to the possibility of more accurate methods of forecasting.

At the present time, Merewether feels American is doing a fairly successful job in forecasting potential trouble spots. But CAT is elusive, and does not always appear where or when predicted. It is for this reason that American will continue to research for better forecasting systems before making drastic procedural changes to avoid it.

Mountain wave feared most

Like the USAF, American finds mountain wave conditions more troublesome than the jet stream. Merewether cites the Rocky Mountain area as the worst. Second comes the region around Pittsburgh and West Virginia.

One of the leading exponents of CAT prognosis among airline weathermen is Henry T. Harrison, chief meteorologist for United Air Lines in Denver. Harrison's comprehensive study has resulted in several manuals on the nature of the problem and on the use of horizontal wind shear in forecasting high level CAT.

The works delve into a meager fund of statistical data to provide an analysis of the subject and to suggest methods of predicting where and when CAT will occur. Other airline meteorologists are aware of Harrison's efforts, and consider him a forerunner in the field of CAT research.

Writing in the May, 1960 issue of The Air Line Dispatcher, Harrison states: "CAT is an operational problem to be respected and it is going to be with us as long as we fly aircraft at levels between 15,000 and 50,000 ft."

Eastern's experience is outlined by J. J. George, weather authority in Atlanta, who states: "We believe we are usually able to forecast moderate CAT and nearly always able to forecast severe CAT, although at present we cannot really delineate between the last two classes.

"We actually overforecast clear air turbulence to a considerable extent in order not to miss significant areas."

Eastern also is delving into statistical data in the hopes of coming up with more valid methods of forecasting. George indicated a report on CAT forecasting would be available by next fall.

George estimates an airliner's chances of running into moderate CAT as one in 1,000, and only one in 4,000 of encountering severe conditions. With proper use of forecasts, he feels the odds could be stretched even further.

EAL's system is to flight plan around CAT when it is forecast, just as the airline would flight plan around a thunderhead. Although mountain wave conditions are common to certain geographical areas, the occurrence of jet stream turbulence is so rare that EAL does not plan to avoid it by major route alterations. If the state of the forecasting art improves, this situation also may change.

Still under wraps is an Air Force study initiated eight years ago but based largely on statistical research of the past two years. A report on the project is still pending.

The body most likely to be concerned with CAT research—the FAA—has no R&D program at present. Weathermen there are still awaiting the results of Air Force and Navy research. At the moment, plans are not specific, but it is likely that an FAA research program will bloom if the military surveys prove inconclusive.

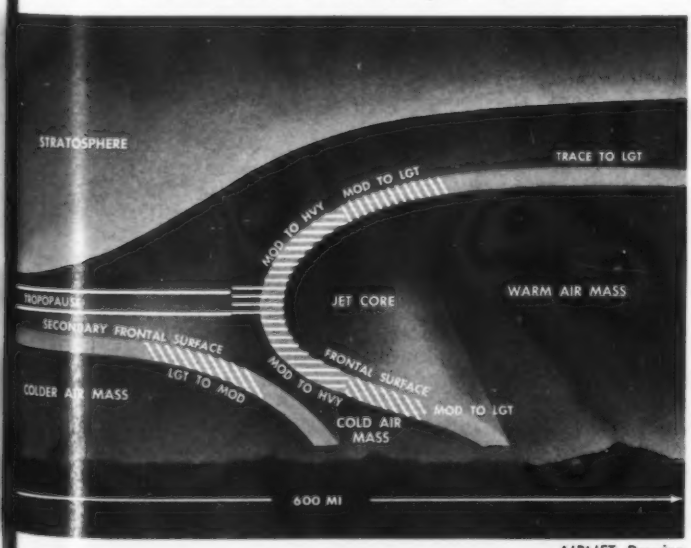
From time to time the subject of airborne detection of clear air turbulence pops up. Some work on the subject has been done by the Stanford Research Institute, but the project is not in full status.

Radar might help

Tests have indicated that 3 cm radar can detect temperature gradients of about 10 degrees across a cold dry front from 75 miles away. Half a degree change has been seen from 5 to 6 miles away.

If satisfactory techniques could be developed, ground-based radar might be able to detect mountain waves or the first gust lines along a thunderstorm, the tops of cumulus clouds and the violent mixing which accompanies such conditions.

Airborne equipment probably would follow. The fine-detail capabilities of X-band radar might prove useful in turbulence detection, but considerable research is necessary before present forms of electronic weather detection equipment can be converted from assaying the visible to discerning the invisible. ■



AIRLIFT Drawing

Pan Am ground training booklet provides basis for above sketch showing where turbulence is likely to be found along jet stream.

AIRLIFT Photo

Leading Analyst Marshall F. Grace prepares upper air prognosis at Suitland, Md., weather station.

FAA's Favorite Visual Approach Aid

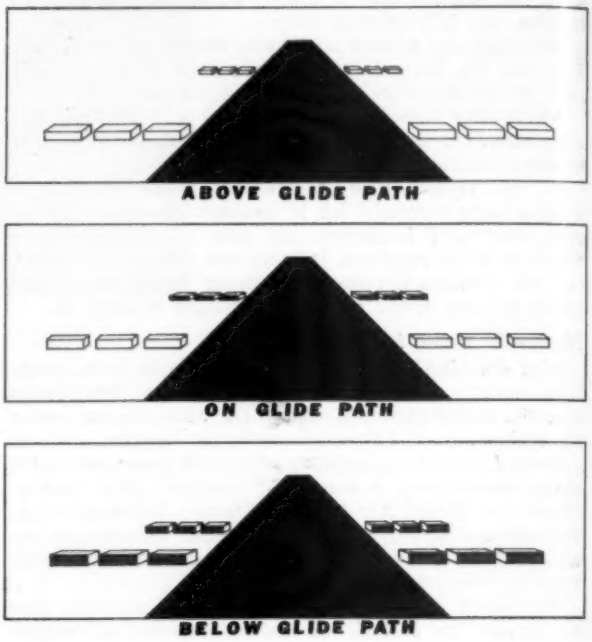
British RAE system ekes out victory over Australian proposal in flight test of competing systems by FAA

IT DOESN'T HAPPEN OFTEN, but FAA's Bureau of R&D is on record in favor of this British system developed by the Royal Aeronautical Establishment as a standard visual approach aid.

It won out over Australia's Cumming-Lane system as pilots participating in FAA's evaluation voted 36 to 22 for RAE. Among big jet pilots (707 and KC-135) the score was 9 to 3.

Cost of complete system is pegged at about $5,700, but Sylvania, the U.S. licensee of the British firm who built it for RAE, expects quantity production of lamps would slice this figure by about 25%. British manufacturer is Thorn Electrical Industries Ltd., Enfield, England.

Decision on adoption is now up to Administrator Quesada, but all indications are he will approve it. ■



What pilots will see when flying RAE visual glide slope, assuming of course, FAA buys and installs it.

One-Two Punch Hits Supplementals

Despite new lease on life from Congress, future of carriers is hinged to military business now threatened by new CAB order

By ERIC BRAMLEY

SUPPLEMENTAL AIR CARRIERS are winning their latest battle to save their certificates, but they face a cut in revenues so severe that some of them may be forced to drop out.

The carriers have been hit by:

A U.S. Court of Appeals decision that CAB didn't have the power to give them certificates (awarded in January 1959) without naming specific points to be served and couldn't put a limit on the number of trips per month to be flown between any two cities.

A CAB letter to the Defense Department stating that air carriers, including supplementals, will no longer be granted a blanket exemption to carry traffic for Military Air Transport Service.

One estimate is that the second blow, unless softened, might cost as much as $27 million a year—30% of the supplementals' business.

Following the court decision, the carriers staged a major drive on Capitol Hill to stay alive. As a result, Congress passed a stopgap bill permitting CAB to issue limited certificates for another 20 months and indicated it will investigate the supplemental situation at the next session.

Cream—skimming operation

Scheduled airlines were unsuccessful in attempts to eliminate from the bill the supplementals' authority to fly 10 domestic trips monthly between any two points, carrying individually ticketed passengers, and to limit them to charters. Airlines have claimed that the 10 trips represent a cream-skimming operation.

Supplementals, however, insist this authority is no bonanza. During 1956-58, for example, they say they carried

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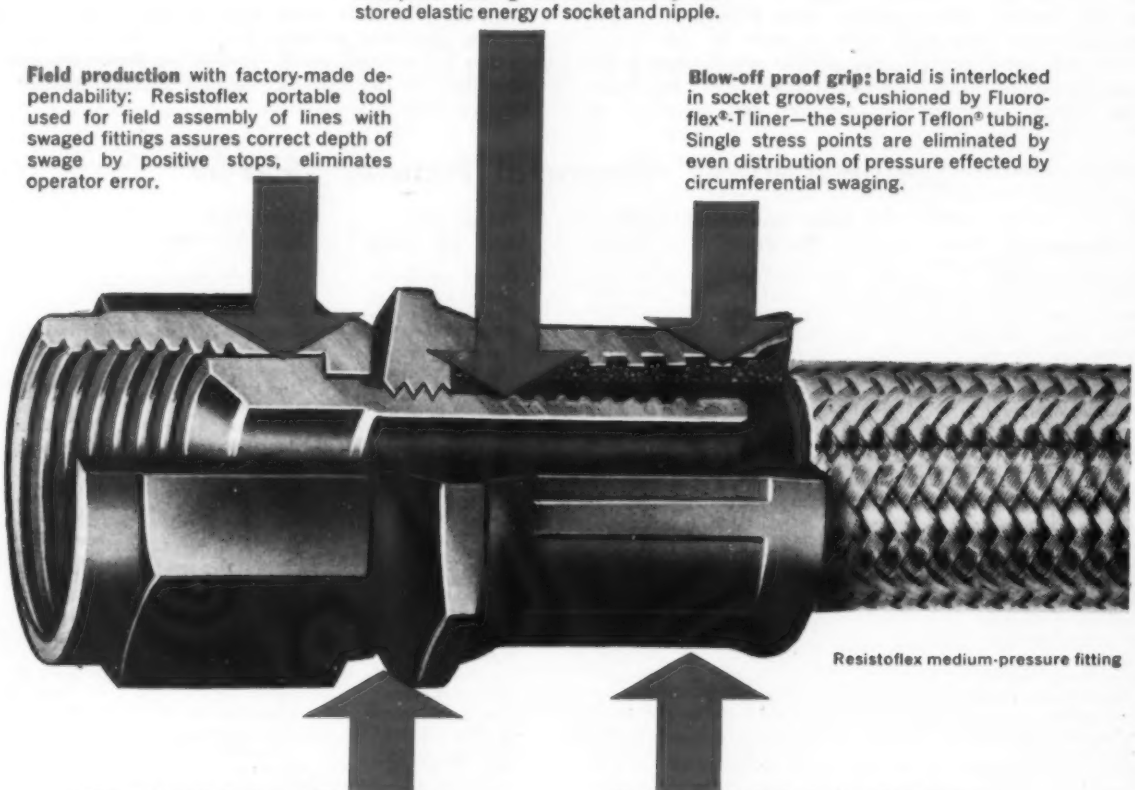
Blow-off proof grip: braid is interlocked in socket grooves, cushioned by Fluoroflex®-T liner—the superior Teflon® tubing. Single stress points are eliminated by even distribution of pressure effected by circumferential swaging.



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less than 1% of the passengers between New York and Miami. And even with the authority, an industry analysis made by one supplemental group shows a 1956-59 loss of $14.1 million on revenues, from all sources, of $241.8 million (see table).

In the upcoming Congressional investigation, it would not be surprising if the carriers argue that 10 trips monthly is not economical and that 15 is a better figure. Some officials feel the lawmakers may be sympathetic.

Board opposes MATS system

Whether anything can be done about CAB's exemption edict remains to be seen. The Board feels that MATS' system of buying transportation from airlines through competitive bidding leads to cut-throat competition and results in operations that are conducted at a loss. It believes the military should pay tariffs that are on file with the agency, and this position is strongly supported by the trunks. In the past, airlines were exempted from provisions of their certificates and from tariff rules in order to bid.

For the supplementals, an end to exemptions would mean the end of overseas MATS business. Their certificates allow the 10 domestic trips monthly and unlimited domestic charters—but no international operation, military or civil, except by exemption.

CAB officials explained that the letter to the Defense Dept. meant the end of the *blanket* exemption granted carriers in the past for military work. Applications for individual exemptions will still be considered where there is an "absence of availability" on a route. But the enlarged capacity of the U.S. international route operators makes it unlikely that many exemptions will be granted, supplementals point out.

They also feel they may be placed in the position of being unable to negotiate for military business because they won't know whether CAB will give them exemptions to fill the contracts. CAB and Defense are still ironing out details of what criteria will cover issuance of individual exemptions, but the picture does not look rosy for the supplementals.

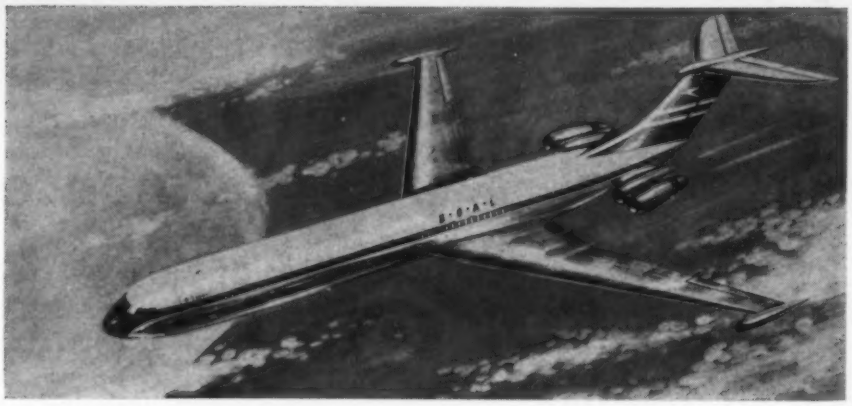
This can mean that $25 million in MATS business will disappear. There is some opinion that individual ticket sales at domestic military bases will also be affected—another $2 million yearly. The $27 million represents almost half of the carriers' military revenue and at least 30% of their total business ■

Supplementals' Financial Picture, 1956-59

Company	Total Operating Revenue	Profit or Loss*	Status on Jan. 28, 1959	Status on June 30, 1960	Location
Aero Finance Corp.	$373,253	($9,594)	Denied certificate	Not operating	
Air Cargo Express	1,083,286	(38,388)	Denied certificate	Not operating	
Air Services	225	58	Denied certificate	Not operating	
Airline Transp. Carriers	2,526,015	33,324	Further hearing	Operating	Burbank, Calif.
All American Airways	4,326,203	237,799	2-year certificate	Operating	Miami, Fla.
American Air Export & Import	4,047,208	166,621	Denied certificate	Not operating	
American Flyers Airline Corp.	1,386,905	18,927	5-yr. certificate	Operating	Ft. Worth, Tex.
Argonaut Airways	1,056,012	(72,610)	2-yr. certificate	Operating	Miami, Fla.
Arctic-Pacific	848.425	(13 762)	2-yr. certificate	Operating	Oakland, Calif.
Associated Air Transport	2,260,750	(17,433)	2-yr. certificate	Operating	Miami, Fla.
Aviation Corp. of Seattle	4,939,967	(255,596)	2-yr. certificate	Not operating	
Blatz Airlines	950 073	20,304	2-yr. certificate	Operating	Burbank, Calif.
Calif. Air Charter	369,871	(36,684)	Denied certificate	Not operating	
Calif. Eastern Aviation	7,913,430	461,405	5-yr. certificate	Not operating	
Capitol Airways	30,210,179	244,229	5-yr. certificate	Operating	Nashville, Tenn.
Central Air Transport	3,883,960	(110,236)	Court of Appeals	Operating	Burbank, Calif.
Coastal Cargo Co.	1,715,305	(67,362)	5-yr. certificate	Not operating	
Conner Air Lines	360,308	(115,169)	2-yr. certificate	Not operating	
Continental Charters	59,671	4,863	Denied certificate	Not operating	
Curry Air Transport	6,552,319	223,132	Court of Appeals	Operating	Burbank, Calif.
General Airways	4,234,887	(431,894)	5-yr. certificate	Not operating	
Great Lakes Airlines	19,374,196	847,829	Court of Appeals	Operating	Burbank, Calif.
Johnson Flying Service	1,851,617	129,966	5-yr. certificate	Operating	Missoula, Mont.
Los Angeles Air Service	4,208,467	(494,212)	2-yr. certificate	Operating	Burbank, Calif.
Meteor Air Transport	5,009,421	(711,157)	Further hearing	Not operating	
Miami Air Lines	1,338,042	(314,780)	Further hearing	Operating	Greensboro, N.C.
Modern Air Transport	3,165,950	297,815	2-yr. certificate	Operating	Newark, N.J.
Monarch Air Service	366,237	18,727	Court of Appeals	Not operating	
Overseas National Airways	23,171,367	(2,098,480)	5-yr. certificate	Operating	Oakland, Calif.
Paul Mantz Air Service	195,179	37,338	2-yr. certificate	Operating	Burbank, Calif.
Peninsular Air Transport	402,559	5,316	Denied certificate	Not operating	
Quaker City Airways	261,092	(14,655)	2-yr. certificate	Not operating	
Regina Cargo Airlines	2,350 830	(7,964)	2-yr. certificate	Operating	Miami, Fla.
S.S.W. (Universal Airlines)	3,625,439	(358,916)	Further hearing	Not operating	
Sourdough Air Transport	6,601	(7,076)	2-yr. certificate	Not operating	
Southern Air Transport	1,796,288	(38,757)	5-yr. certificate	Operating	Miami, Fla.
Standard Airways	417,737	162,980	5-yr. certificate	Not operating	
Stewart Air Service	1,521,633	161,876	5-yr. certificate	Operating	Los Angeles, Cal.
Unit Export Co.	930,600	4,351	Court of Appeals	Not operating	
Trans-Alaskan Airlines	967,926	49,606	Court of Appeals	Operating	Burbank, Calif.
Trans Caribbean Airways	3,930 878	2,086,819	Now has rt. cert.	Cert. carrier	
Transocean Airlines	50,846,495	(12,151,441)	5-yr. certificate	Not operating	
United States Overseas	30,720,158	(2,011,536)	2-yr. certificate	Operating	Wildwood, N.J.
U.S. Aircoach	117,319	830	Denied certificate	Not operating	
World Airways	6,008,818	140,281	5-yr. certificate	Not operating	
World Wide Airlines	179 843	(128.072)	Further hearing	Operating	Burbank, Calif.
TOTAL	241,862,944	(14,151,378)			

* Parenthesis indicates loss.

NOTE: Revenue covers all sources—military, charter, 10-trip authority, etc. Jan. 28, 1959 was date of CAB decision in supplemental case, prior to which carriers operated under exemptions. "Court of Appeals" notation means certificate was denied and carrier has appealed. "Further hearing" means CAB is considering the case. California Eastern's revenues during the period were primarily from leasing, overhaul and maintenance. Trans Caribbean's revenues, for the period before it became a scheduled carrier, include aircraft rentals.



Super VC-10 (right) heads list of new projects in the mill in U.K. It joins BOAC fleet in 1965.

Vickers

Transport Talk Picks Up in Britain

BY MICHAEL DONNE

RECENT WEEKS HAVE SEEN a number of new transport aircraft developments in Britain, the most significant of which has been the decision by British Overseas Airways Corp. to order 10 new Vickers Super VC-10 jet airliners, at a cost of $70m. This is an advanced development of the standard VC-10, of which BOAC already has 35 on order.

The Super VC-10 is intended for special high-density traffic routes, such as the North Atlantic, where it will be capable of carrying 212 economy class passengers, or 62 more than the standard aircraft. The extra capacity has been obtained by extending the fuselage 28 feet—20 feet being in front of the wing.

The basic aircraft design remains as standard. Engines are four Rolls-Royce Conway 42/2s. Fuel capacity has been increased 12,000 lbs. by addition of two 750 Imperial-gallon tip tanks. The extra fuselage size has increased underfloor freight volume from 1,350 to 2,000 cubic feet. A second freight loading door has been added.

Stage of 4,000 miles

With a maximum 58,000 lbs. payload, reserve for one hour and a 230-mile diversion, the Super VC-10 can fly a stage of just over 4,000 miles in zero wind, standard day. On London-New York (3,950 miles, with strong headwinds) the Super VC-10 can carry its full complement of passengers and baggage plus 8,000 lbs. of freight. The aircraft will have a cruising speed of some 575 mph. The Super VC-10 joins BOAC's fleet in 1965, while the standard VC-10 joins in 1963.

Leading particulars of the Super VC-10 are:

Maximum take-off weight—347,000 lbs.
Maximum landing weight—241,000 lbs.
Maximum zero fuel weight—219,000 lbs.
Maximum payload—58,000 lbs.
Maximum fuel capacity—150,000 lbs.

While work has begun on the Super VC-10 and is building up on the standard VC-10, Vickers-Armstrongs (Aircraft—now a member of British Aircraft Corp.) is reviving its interest in building a short range jet as a replacement in the Viscount and Convair category.

Its goal is an aircraft with probably two aft-mounted turbofan engines and capable of carrying between 40-50 passengers at stages up to about 700-800 miles, at a speed of around 600 mph. Such an aircraft would be smaller than the Caravelle. There is a good deal of design experience and research into this field within British Aircraft Corp. Hunting, one of the members, some time ago came out with its 107 twin-jet design, while Bristol came up with its own 205 design, both of them broadly in the same category. Neither of these designs went into production, although Hunting built a 10% mark-up.

Full range of aircraft

Addition of such a short-range jet to the Vickers "family" would enable the British Aircraft Corp. to offer a complete complementary range of aircraft, from the Super VC-10 and Standard VC-10, to the VC-11 medium-range jet, down to the short-range type. So far, no decision to build such a short-range jet has been made, and the design work is as yet only in its earliest stages.

British Aircraft Corporation is not alone in its interest in this field, since some time ago A. V. Roe, a member of the Hawker Siddeley Group, came out with two design studies to help in its discussions with airlines. These were the Avro 761 and the Avro 771. The Avro 761 is larger for 65 passengers, using two rear-mounted Rolls-Royce RB 163 jets of 10,100 lbs. thrust each. Both aircraft would cruise at about 600 mph over stages of up to 500 miles.

One of the questions that remains to be answered before any short-range jet goes into production in Britain is how far such a project would be supported financially by the Government. Some time ago Mr. Duncan Sandys, Minister of Aviation, made it clear that the Government might be prepared financially to assist "suitable" projects, either by placing direct orders for production for "off-the-shelf buyers," in anticipation of orders, or by making direct financial contributions to the development costs.

So far, neither of these two techniques of Government assistance for British transport aircraft production have been employed, and neither is there any indication of when they will ever be employed. It is felt in the aircraft industry, however, that the short-range jet offers an excellent reason for the Government to live up to its promises.

There is also the possibility that British European Airways, with a plethora of short-range routes both within the United Kingdom and to the Continent, might take an interest in a short-range jet. In fact, B.E.A. would be the logical first target for the sales teams of the manufacturers anxious to get started. ■

Exclusive

First Look at ALPA Finances

Pilots' union shows a healthy $4.1 million in assets and $3.2 million net worth at close of last fiscal year. Salaries top $500,000

U. S. AIRLINES, accustomed to living in a goldfish bowl as far as finances are concerned, have a new partner—the Air Line Pilots Association.

Carriers for years have bared their souls to the CAB, and now ALPA, for the first time, is disclosing its financial condition to the Labor Department. And, from the documents filed, this condition is one of extreme good health.

Here's what the figures reveal:

ALPA had $4.1 million total assets and total net worth of $3.2 million at the close of the 1959 fiscal year (Sept. 30, 1959).

Current assets of $3.2 million compared with current liabilities of only $124,085.

Like the airlines, union expenses have been rising faster than revenues. In 1959, revenues totaled $2.8 million, up 2.7%, while expenses rose 10.8% to $2.6 million. Operating income dropped from $317,086 in 1958 to $130,963 in 1959 (the latter figure adjusted downward by $35,125

(Continued on page 33)

What ALPA Pays in Salaries

Year Ended Sept. 30, 1959

Officers	Title	Salary	Expenses	Flight pay Loss
C. N. Sayen	President	$35,000	$2,177.73	.....
S. W. Hopkins	V. P.	.....	1,075.07	.....
K. McMurray	Exec. V.P.	20,000	1,685.22	.....
R. L. Tuxbury	Sec.	.....	1,498.55	.....
D. J. Smith	Treas.	.....	1,201.83	425.34
C. C. Spencer	Reg. V.P.	.....	1,220.10	1,195.56
E. P. Rordam	Reg. V.P.	.....	422.70	2,006.52
C. E. Luther	Reg. V.P.	.....	1,734.49	619.88
A. D. Adams	Reg. V.P.	.....	975.00	1,775.42
H. B. Anders	Reg. V.P.	.....	2,203.59	155.31
R. J. Rohan	Reg. V.P.	.....	100.06	2,525.41
C. L. Anderson	Acting Reg. V.P.	.....	65.51	211.10
		$55,000	$14,359.85	$8,914.54
Employes				
F. J. Albright	Negotiator	$11,100	$5,285.33	
W. W. Anderson	Exec. Asst.	10,000	537.45	
T. A. Basnight	Safety Rep.	10,900	471.75	
F. H. Bennett	Attorney	11,750	622.03	
L. Cates	Wash. Rep.	12,000	.....	
J. C. Christie	Negotiator	13,500	3,588.06	
S. A. Colvin	Administrator	12,700	339.03	
C. F. Eck	Engineer	10,900	641.33	
A. Gramza	Attorney	8,250	1,911.65	
R. L. Harkenrider	Negotiator	10,300	4,116.84	
*V. J. Herbert	Negotiator	11,500	590.95	
G. R. Johns	Coordinator	9,750	814.22	
H. M. Jones	Negotiator	11,500	3,089.93	
L. Koch	Negotiator	11,300	4,229.90	
T. G. Linnert	Engineer	11,600	1,127.90	
W. J. MacWilliams	Statistician	10,050	3,072.35	
E. C. Modes	Editor	10,000	562.12	
J. P. O'Brien	Attorney	9,000	2,895.69	
*W. Schneider	Negotiator	9,600	.....	
M. H. Schy	Attorney	11,250	3,412.99	
J. Ulm	Negotiator	9,000	3,198.09	
J. D. Vrechek	Negotiator	7,750	2,855.13	
M. B. Wigderson	Attorney	9,800	3,978.78	
		$243,500	$47,341.52	

NOTE: C. N. Sayen received allowance of $3,000 for the year.
*Affiliated with Air Line Employes Assn. (affiliated with ALPA).

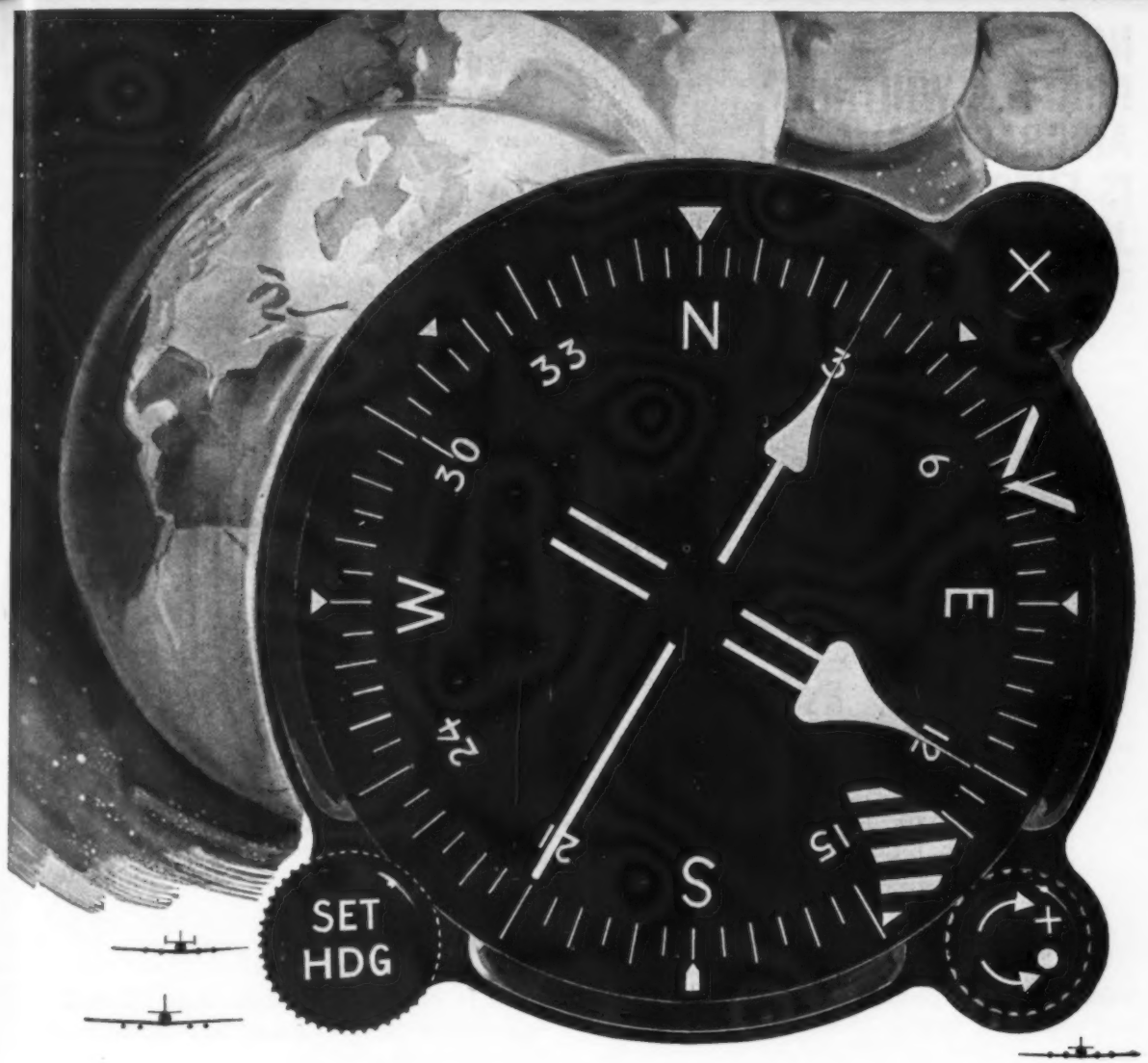
How Its Money Comes and Goes

Fiscal Years 1958 and 1959

	1958	1959
Income		
Initiations	$35,525	$18,125
Dues	2,605,829	2,646,957
Penalties	8,806	14,061
Advertising, Air Line Pilot publication	9,394	10,429
Investments	90,776	98,831
Rents received	25,148	39,576
Total income	2,778,429	2,853,373
Operating income	425,940	245,956
Convention expense reserve	100,000	95,998
Net operating income	317,086	130,963 (1)
Expenses		
Membership benefits, strikes	5,435	31,799 (2)
Legal	125,465	165,680
Negotiations	510,639	594,277
Engineering and safety	124,634	122,730
Public relations	45,149	56,492
Various councils	95,571	126,974
Master executive council	323,365	341,328
Committees (those exceeding $2,000 in 1958)		
Jet study	3,185	193
Scheduling	23,721	21,279
Executive	20,131	25,947
Pilot training	4,877	214
Military affairs	2,535	414
CAA enforcement	2,269	2,724
Flight engineering problems	9,000	655
Behncke retirement	7,187	7,812 (3)
Organizing expense	37,790	4,190
President's retirement	4,000	7,000
Contributions	7,397	2,715
Postage	46,312	49,805
Executive salaries	317,822	321,833
Clerical salaries	247,513	226,960
Telephone	21,391	23,411
Transportation	44,033	48,906
Total expenses	$2,352,489	$2,607,417

Note: Selected items only.
(1) 1959 net operating income adjusted by $35,125 for "pilot retirement loss," resulting in net income of $95,838.
(2) In 1958, $5,435 for Western strike. In 1959, Eastern Strike, $2,548; American, $27,726; Capital, $1,312; TWA, $213.
(3) The late David L. Behncke was former ALPA president.

Source: Airlift Research



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...the heart of precision navigation

The directional gyro continuously synchronized to the earth's magnetic field . . . the Sperry Gyrosyn® Compass that revolutionized heading information for flying when it was introduced in 1944 . . . is still at the heart of precision aircraft navigation. Today there is a Gyrosyn Compass System for all types of aircraft – military, commercial, executive and private.

The Gyrosyn combines the functions of both a directional gyro and a magnetic compass. The differences in the particular models–which include the C-2, C-4, C-8, C-9, C-10 and C-11–relate to size, weight, performance and cost consistent with the application.

The C-2 is the lightest and most compact system available, weighing only 8¼ pounds. The transistorized C-11 incorporates Rotorace® suspension to hold random drift within ± 0.5 degrees an hour in "free-gyro" operation on transpolar routes. As Doppler navigators come into widespread use, Gyrosyn systems will be a "must" in meeting critical accuracy requirements.

Sperry has produced and sold **more** high-accuracy compass systems than **all** other manufacturers combined.

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Split boss piston

Solid boss piston

Take this pair of pistons, for example. Both split and solid boss designs—interchangeable in your engine—have been available as original equipment parts for many years. The record of experience, however, has proven that the solid boss piston is more reliable under a greater range of operating conditions.

In the design of every aircraft engine part produced by Pratt & Whitney Aircraft, there is this basic rule: Only the best is good enough. That is why Pratt & Whitney Aircraft now specifies the solid boss piston for all replacement requirements.

You can see some *design* differences. Most *quality* differences, however, are not so easy to spot, especially in smaller components. Just the same, our engineers never finish experimenting, redesigning, testing and improving.

Without access to these continuing improvements, a look-alike substitute cannot duplicate the complete compatibility and dependability engineered into Pratt & Whitney Aircraft *original equipment parts*. Before you can detect the difference, your engine will.

For reliability and economy, specify Pratt & Whitney Aircraft *original equipment parts* when you overhaul a Pratt & Whitney Aircraft engine. They are quickly available from authorized distributors throughout the United States and Canada.

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(Continued from Page 30)

"pilot retirement loss" to a net of $95,838).

Dues from members reached $2,646,957 (ALPA earlier this year listed 13,698 members), up 1.5% from 1958.

There are 18 union officials receiving $10,000 or more a year, topped by president C. L. Sayen's $35,000 plus $3,000 allowance. The expenses of 33 officers and employes were $61,701, an average of $1,850 each.

Executive salaries increased from $317,822 in 1958 to $321,838 last year, or 1.2%, while clerical salaries fell 8.5% from $247,513 to $226,960.

Union investments total $2.8 million, of which $2.3 million is in non-government bonds and notes and corporate stocks.

Expenses connected with "membership benefits" were $984,111 last year, the largest items being $594,277 for negotiations and $165,680 for legal fees. ■

The Balance Sheet

Selected items for Fiscal Years 1958 and 1959

	1958	1959
Cash in banks	$42,374	$180,027
Investments		
ALPA Federal Credit Union	10,000	10,000
Other (1)	2,761,368	2,865,004
Total current assets	2,937,569	3,214,935
Fixed assets (buildings, land, furniture)	889,410	874,164
Affiliates' accounts-questionable	40,519	44,835
Total assets	**3,868,189**	**4,136,744**
Total current liabilities	26,285	124,085
Reserves	338,590	197,738
Net income	317,086	95,838
Total net worth	3,013,137	3,191,021
Total liabilities and net worth	**$3,868,189**	**$4,136,744**

(1) 1959 investments include $544,350 in government bonds and notes, $1,705,474 non-government bonds and notes, $615,180 corporate stock.
NOTE: Fixed assets are listed at depreciated value.

Used Transport Market Still Slumps

THE MARKET IN USED TRANSPORTS is soft. There's lots of merchandise on the shelves, but it isn't moving.

There's some demand, but getting buyer and seller together is tough. Price, of course, is a factor, but an even bigger problem is financing.

However, even with a soft market, aircraft dealers insist things aren't as bad as was predicted last year in Northwestern University's study of prices (*AIRLIFT*, July '59).

Indicative of the state of the market is the fact that a recent weekly report by Aircraft Exchange showed only seven bids in two and one-half pages of listings. Frederick B. Ayer & Associates, large dealer, admits things are slow. General Aircraft & Leasing division of General Dynamics, established two years ago, succeeded in leasing 12 American Airlines DC-7s last year to Overseas National Airways for military contract work, but has been unable to move 13 others. So far, no airline has sold a DC-7.

"There is continued interest, but little action," says one observer. "Everyone wants something, but few have the money to buy. Some small foreign airlines need equipment, but their credit isn't good enough."

Convairs, particularly the 240, are moving to corporate buyers "fairly well." Supply of 340s and 440s is described as "tight." There's a little activity in DC-6 models and some interest in leasing Convairs and DC-6s.

But in general things are slow and might be more depressed except for one factor: some airplanes have been or are being converted to cargo versions instead of being offered for sale. Examples: American, 15 DC-7s; Pan American, 10; Eastern, five 1049C Constellations.

What about prices—and how do they compare with some of the gloomy Northwestern forecasts?

Aircraft Still for Sale

Model	Number	Asking Price Range	Northwestern 1960 Forecast
CV 240	10	$130,000-160,000	$250,000-350,000
C-46	32	42,000-200,000	*
C-47	35	45,000-125,000	*
DC-3	26	35,000-70,000	scrap
DC-4, 4E	8	190,000-265,000	90,000-120,000 (1)
DC-6	14	380,000-575,000	80,000-130,000
DC-6A	1	725,000	*
DC-6A/B	4	880,000-1,050,000	*
DC-6B	9	450,000-470,000	230,000-310,000
DC-7, 7B, 7C	14	700,000-1,200,000	scrap
L-049	4	150,000-185,000	70,000-110,000
L-749A	12	250,000-400,000	90,000-140,000
L-1049 all models	7	500,000-1,030,000	100,000-150,000
Viscount 708	2	500,000	320,000-450,000
Viscount 755D	2	900,000 (2)	*
	180		

Notes: Asking prices listed by Aircraft Exchange.
*Not included. (1) basic DC-4. (2) Includes spares.

Prediction fails to materialize

The study predicted that turbo-compound models, such as DC-7, Lockheed 1049G and 1649, might be at or near scrap values as early as late 1959 and almost certainly by the end of 1960. The 1959 prediction didn't materialize and dealers doubt that this year's will, either. Asking prices for DC-7s range from $700,000 to $1.2 million. A 1049G is $700,000. It should be emphasized that these are asking prices—not what buyers, if any, will pay. Northwestern, incidentally, over-priced the Convair 240 (see table).

Several other models—DC-6s, L-049s, L-749s and L-1049s—were forecast to be at or near scrap values by the end of 1960 or during 1961. DC-6s have been offered at $380,000 each (for six) to $575,000 (for two), and a bid of $300,000 found no takers. Asking prices for other models in this category are also well above scrap value.

The DC-6B, expected by Northwestern to remain considerably above scrap value during the 1959-65 period and to sell at $230,000 to $310,000 this year, is available at $450,000 to $470,000 in lots of four or five. The workhorse DC-3, forecast at scrap value, ranges from $35,000 to $70,000.

Among bids listed by Aircraft Exchange was a Convair 240 at $130,000, a convertible cargo-passenger DC-6A/B at $850,000, two 749As at $225,000 each and one at $250,000, and a 1049A at $350,000.

One dealer says the situation is "nowhere near as gloomy" as pictured by Northwestern's study, which is "only about 30% correct." Another believes the predictions were "a year or two early."

Dr. Stephen Sobotka, Northwestern's project leader for the study, told *AIRLIFT* that he has not followed the market closely enough in the past year to be able to comment on the predictions. ■

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Tasty Martinis And Tender Steaks Boost Revenues

By FRED S. HUNTER

Lokey: "A capable operator doubles the volume . . . "

ASK any regular air traveler where the best airport food in America is served.

Ten to one, he'll answer: San Francisco.

If not, chances are he's never been there or has never tarried long enough to sample the viands.

Airport restaurants in the U.S. are not noted for the quality of their steaks and Martini's. Most are indifferent. Some are downright bad. A few, including San Francisco, are excellent.

Thus it was that *AIRLIFT* went to Hulsey S. Lokey, president of Interstate Hosts, Inc., contractors for the food and beverage concession at San Francisco International Airport, to ask two questions:

1) How can airport operators go about insuring better restaurant and bar service for air travelers in planning new or expanded terminal facilities?

2) How can airport operators net more revenues for themselves from food, beverage, newsstand and gift shop concession contracts?

This was his answer:

"In our meetings with airport management groups, we recommend two fundamental principles that will lead to better airport food operations, and, in turn, to more revenues to the cities. First of all, the operator should be well chosen in advance of finalizing the design plans for the entire airport. There are no two restaurant operators with the same ideas and choosing the operator early will eliminate duplication of architectural plans as they relate to utilities and location of facilities.

Against percentage bids

"Our second belief is that it is wrong for an airport governing body to solicit bids for the operation of food facilities on a straight percentage bid basis. In so doing, many airports end up with operators that take advantage of the traveling public through high prices and poor service and in the end the city does not derive the revenue it would from a capable operator who would generate double the volume."

Airports are entitled to ask an airport restaurant operator to pay a fair percentage rental. But it should be no higher than a prudent businessman can afford to pay. At San Francisco, Interstate pays approximately 9¼% on food, 15¼% on liquor.

Another factor which an airport management should investigate in selecting a restaurant operator is his record on plowing back profits to keep facilities in excellent condition. Airport restaurants also depend upon repeat customers, says Lokey.

Interstate Hosts has been catering to the traveling public since 1897, when, known as the Interstate Van Noys News Co., it operated railroad station restaurants, newsstands and train news agents. At one time it had contracts with 63 different railroad companies. After Lokey, once superintendent of in-plant feeding at Lockheed Aircraft Corp., became president in 1951, Interstate did a right-about face. It began cancelling its railroad contracts to concentrate on turnpikes and airport terminals.

Units down, revenues up

Under Lokey's stewardship, Interstate in the last nine years has cut its number of units from 175 to 72, but at the same time it has boosted revenues from 10 million in 1951 to $19.5 million in 1959. Some outside estimates have been made that this will go to $29 million by 1965.

Last year, revenue from airports represented about one third of Interstate's total. Lokey's projections estimate 70% will be generated at airports by 1962. Included will be the new Los Angeles operation where Lokey expects a first year volume of no less than $7 million.

In its lease agreement, Interstate guaranteed to invest $1.5 million in its Los Angeles facility. Its present investment estimates are somewhat above $2.4 million.

"But where else in the world could you open up a restaurant and do $7 million worth of business the first year," comments Lokey.

To illustrate how an airport profits by having an ethical operator capable of generating 30 to 40% more volume than a poor operator who is out to make a fast dollar at the expense of the traveling public, Lokey points out that Interstate is averaging $1.91 per enplaned passenger at San Francisco. This is believed to be the highest of any air port in the U.S.

Last year Interstate turned a volume of $3.9 million at San Francisco. This year its target is $4.3 million. Present dollar rental is running approximately $1200 a day.

Big volume not mandatory

Big airports, where the volume of business should reach $1 million a year or more, present the better opportunities for large restaurant operators. But Lokey believes a traffic of more than 100,000 enplaned passengers a year will justify a modern coffee shop and dining room food operator at an airport terminal. Lokey has experience in such an operation at Sacramento, where Interstate has been able to develop a good luncheon and dinner business from the residential district in which the airport is located.

Growing Interstate currently has restaurant and bar contracts at four terminals, San Francisco, Sacramento, Detroit Metropolitan and New Orleans Moisant International. It has gift shops at Philadelphia, O'Hare in Chicago, Stapleton Field, Denver, and Love Field, Dallas. Opening of Los Angeles International will make its ninth airport operation. It is actively working on three new proposals in this country and—sign of the jet age—is eyeing two airports outside the continental limits of the U.S.

So what's the air traveler's favorite dish?

"Hamburger, what else?" grins Lokey.

BOAC ORDERS 10 VICKERS SUPER VC 10's

BOAC has followed its contract for 35 Vickers VC 10 jetliners by ordering from British Aircraft Corporation ten Super VC 10's—aircraft which are tailor made for high density routes such as the North Atlantic.

In an economy class layout the Super VC 10 can carry up to 212 passengers plus 4 tons of freight non-stop from London to New York against strong headwinds.

Both Vickers VC 10 and Super VC 10 with their new look clean wings and rear-mounted engines will offer an air field performance and a cabin comfort which will make them the most passenger preferred long haul jets in operation.

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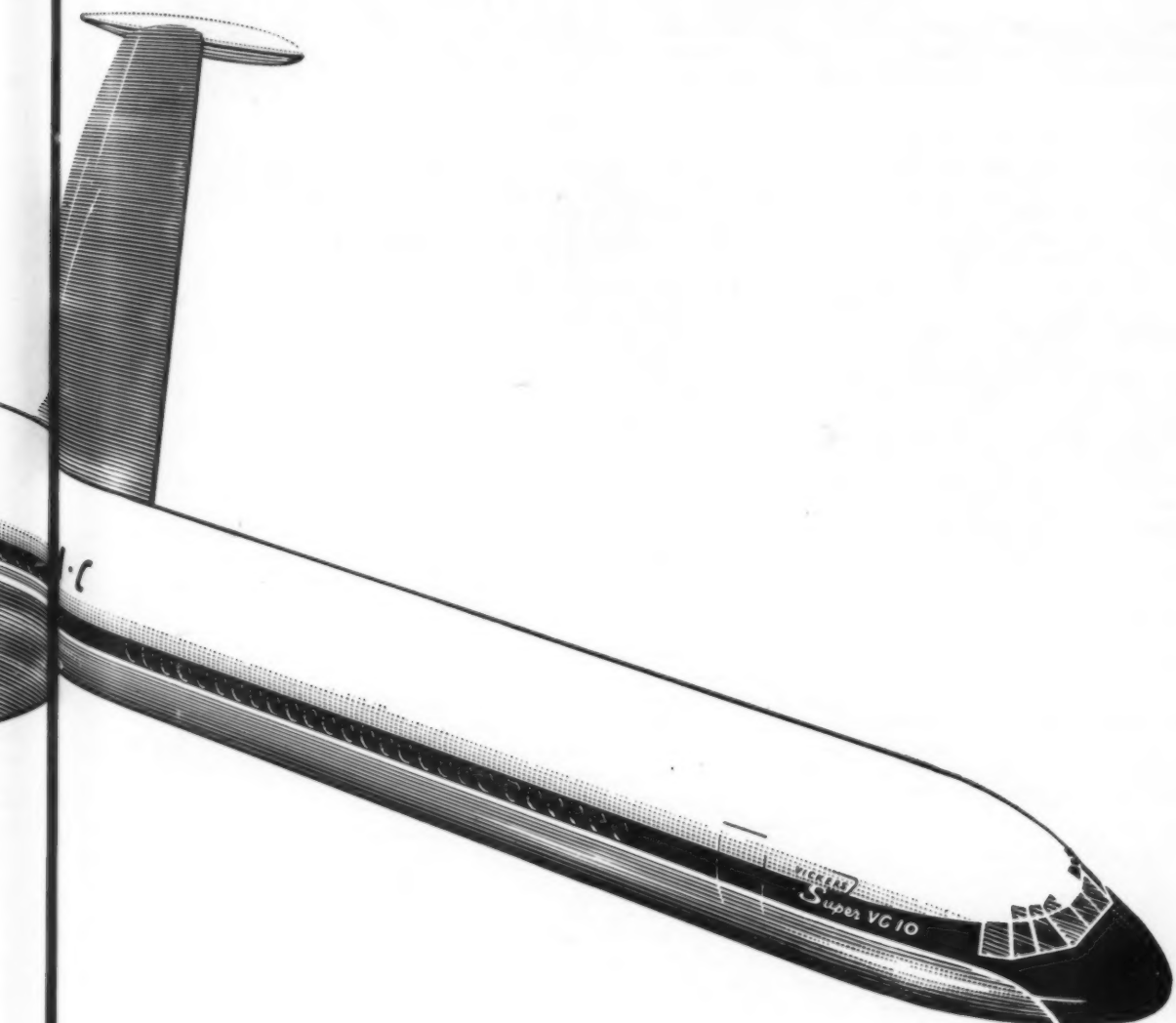

VICKERS
Super VC 10

POWERED BY FOUR REAR-MOUNTED ROLLS-ROYCE CONWAY BY-PASS ENGINES
MEMBER COMPANY OF BRITISH AIRCRAFT CORPORATION

TECHNICALLY SPEAKING

By J. S. Murphy

Why the used DC-7s aren't selling . . . FAA makes a mess out of "AD" management . . . Convair vibration doesn't crack plaster . . . Why those $122 "hinged covers" in jets.

Here's your first taste of a new *AIRLIFT* feature, on the technical side, but hitting all phases of air transport—airlines, manufacturers, FAA, air traffic control and what have you.

It's all new, sometimes mixed with opinion. But we have ours and you have yours so don't hesitate to call our hand if we get too far apart. All comments are welcome and we'll print them all unless you insist otherwise.

BEHIND THE TIMES?—FAA is one of the biggest reasons for the "No Sale" sign on DC-7s in the used-transport market. Airlines and Curtiss-Wright have shown a marked improvement in the Turbo Compound engine reliability, but FAA maintenance people are turning their heads. Restrictions on overhaul periods make the engine look as bad it ever was. But tisn't true.

IT ALL ADDS UP—We still haven't recovered from the $122 pricetag on the lavatory seat for a new jet. It stole the show at TWA's supplier symposium (*AIRLIFT*, July). No, the airlines aren't buying that model! But Power Coulter of Monogram Industries gave us the background. The spec called for a seat of certain strength and weight of an injection-molded plastic. The molds alone ran $8,- or $9,000 and the order was for only 30. Figure it out. At that rate $122 is cheap! TWA, by the way, calls them hinged covers.

LIGHTPLANE AIRLIFT—Credit Beech Aircraft and its German distributor Travelair GMBH for a smart marketing move in airlifting four lightplanes from Wichita to Bremen in only 12 hours. Three Debonairs and a Bonanza (with wings, tails and props removed) were carried aboard newly-modified Lufthansa 1649A freighter.

LEGALITY OR SAFETY?—We're all for W. K. "Bill" Lawton, exec director of National Business Aircraft Assn., in his drive to straighten out the mess in FAA handling of airworthiness directives. His letter to FAA (in July Skyways) merits Administrator Quesada's personal attention. CAA had a good system with "AD's" but FAA tends to put more emphasis on being legal than on safety. It's been a giant step backward, not at all in keeping with the intent of the change from CAA to FAA.

DID YOU KNOW?—That only the day before the Northwest Electra accident CAB investigators handling the Braniff Electra mishap admittedly were up against a blank wall as to its cause.

That it apparently doesn't pay manufacturers to get too far afield from the experienced airline seat builders, even if they insist on designing the seats themselves. Convair is shifting from National Seating (bus experts) to Hardman for the second-round supply for 880/600s. Douglas is talking to both Hardman and Aerotherm about taking over seat production for the DC-8.

MORE POWER TO 707—TWA is pushing up the power on its 707s. JT3s in its -121s are getting the 13,500-lb. rating while JT4s are going from the -3 at 15,800 lbs. to the -9 at 16,800. Next step will take the JT4 to the -11 at 17,500 lbs., a project costing several millions that TWA's board must OK.

WE STILL HEAR GRIPES—In fact would like to voice some of our own over ATA's policy on meetings. Some technical types got caught (only once) for $3 breakfasts in New York and the low for hotel rooms in Kansas City is about $15 (Miami ran about $4). Looks like no gain, maybe even a loss, on the set economy edict to restrict meetings to NY, KC, Chicago or Washington.

OF PEOPLE AND THINGS—Dave Little, American Airlines' big contributor to common sense in airline ATC progress is back flying the line. He will be missed sorely. On his return to flying, Dave teamed up with "all weather" Ernie Cutrell before the age 60 rule got to Ernie on March 15. Ernie is now a part-time consultant with Dixon Speas.

Two other AA pilots recently enjoyed the rare treat of being able to "buzz" a midwest residence with (of

all things) a Convair 240. It was all part of a lawsuit by a resident near Joplin airport who claimed vibration from AA's 240 cracked his plaster.

Insurance folks instrumented the house, then had the special flights arranged. They proved the vibration didn't approach being sufficient to cause the damage.

JET BUGS BITE HARD—The biggest headache for DC-8 operators has been windshield failures. There have been so many we lost count, but the failures weren't the only problem. Every time one cracked it would take half a day to get the DC-8 back into service. The replacement panel adhesive had to cure for six hours! What a way to have an airplane depreciating at the rate jets do.

Douglas is on top of the problem with a rework to speed up replacement and with a new panel. Pittsburgh Plate Glass replaces Libbey-Owens-Ford.

For a 14" x 10" lithographic print, suitable for framing, write Aviation Division . . . Request Historical Series #4.

November, 1916 . . . Richthofen in his D II duels with the British Ace, Major L. G. Hawker.

Early War Birds— THE ALBATROS D II

This World War I plane and its "V-strutter" successor, the D III, were largely responsible for German air supremacy during the Winter of 1916-17. Powered by a 160-horsepower Mercedes engine, the Albatros D II had a top low-level speed of 110 mph and an initial rate of climb in excess of 1000 feet per minute. Synchronized twin Spandau machine guns were mounted forward of the cockpit. A noteworthy action involving the D II was that between Baron von Richthofen and Major Lanoe G. Hawker. This English flier, who had already won the Victoria Cross for his daring feats, was to be the first real test of Richthofen's ability.

On November 23, 1916, following a general engagement of De Havilland 2's from R.F.C. No. 24 Squadron and Albatros D II's of "Jagdstaffel Boelcke", Richthofen and Hawker found themselves engaged in a man-to-man duel. The action began with Hawker on the Baron's tail, firing a short burst from his single Lewis gun. Banking sharply, Richthofen tried unsuccessfully to reverse their positions. They then began chasing one another in ever tightening circles and looping maneuvers with neither being able to line up a telling shot. But the odds were against Hawker and his agile but slow DH-2 since they were gradually drifting further behind German lines. Finally, running low on both gas and altitude, the gallant Briton broke off, making for home . . . zigzagging to avoid the pursuing Richthofen. The British Ace almost escaped. But Richthofen and the superior Albatros won.

Hawker fell mortally wounded just before the Allied lines. Manfred von Richthofen had achieved his eleventh victory. He had also demonstrated the skill and calculating purpose that was to make him the war's highest scoring ace . . . and the renowned, first commander of Germany's famed "Jagdgeschwader Nr. 1" or "Flying Circus".

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Trunks Down $18.3 Million

With the official record still a full month shy of the effects of the July 1 fare hike, the pen that jots trunkline financial fortunes plunged deeper into red ink. Its latest entry: Minus $18.3 million for the first five months.

While five carriers were ekeing out an $8.6 million profit, seven others were dropping $26.9 million. One carrier (TWA) was losing more than the combined gains of all five operating in the black.

The regionals, more so than the so-called "big four," appear to be holding their own. On the plus side, the trio of Delta, Western and Continental show gains of $7.5 million or 85% of all trunk profit.

On the minus side, the five other regionals account for only 35% of the total losses. Significantly, one of their members (Capital) alone represents 19%.

As a group, the regionals lost $2 million or 11% of the trunk deficit. The "big four" accounted for the remaining 89% with a $16 million loss.

First Five Months Finances

Operating Profit or Loss (000)

Airline	*May*	*Year to Date*
American	$1,077	$956
Braniff	294	(117)
Capital	(710)	(5,233)
Continental	470	1,637
Delta	964	3,401
Eastern	(2,007)	72
National	(1,103)	(1,552)
Northeast	(542)	(1,814)
Northwest	(534)	(897)
TWA	(728)	(8,787)
United	1,174	(8,482)
Western	171	2,465
All Trunks	($1,472)	($18,351)

ON TIME BOXSCORE

April 1960

Airline. Ranking	On time to 15 min. late
TRUNKS	
1 United	79.6
2 TWA	77.3
3 Western	76.7
4 Continental	76.1
5 Braniff	75.0
6 Capital	73.6
7 Delta	72.7
8 American	69.9
9 Northwest	67.2
10 Northeast	66.9
11 Eastern	62.1
12 National	38.3
707 & DC-8	
1 TWA	66.9
2 Continental	65.1
3 Delta	60.4
4 National	52.8
5 American	50.1
6 United	43.3
7 Braniff	40.8
8 Eastern	24.7
9 Northeast	22.4
ELECTRA	
1 Braniff	65.0
2 American	62.3
3 Western	56.0
4 Northwest	42.4
5 Eastern	35.4
6 National	11.0
LOCAL SERVICE	
1 Central	95.8
2 West Coast	95.2
3 Piedmont	95.2
4 Allegheny	81.3
5 North Central	79.6
6 Lake Central	79.0
7 Ozark	76.3
8 Trans Texas	73.9
9 Bonanza	73.4
10 Frontier	71.5
11 Southern	71.2
12 Mohawk	67.7
13 Pacific	47.0

Note: Nonstop and one-stop flights only.
Source: AIRLIFT Research.

'60 Outlook Sours As First Half Lags

It is highly improbable that domestic trunks this year will even approach the traffic gains they showed in 1959. Reason: a disappointing first half.

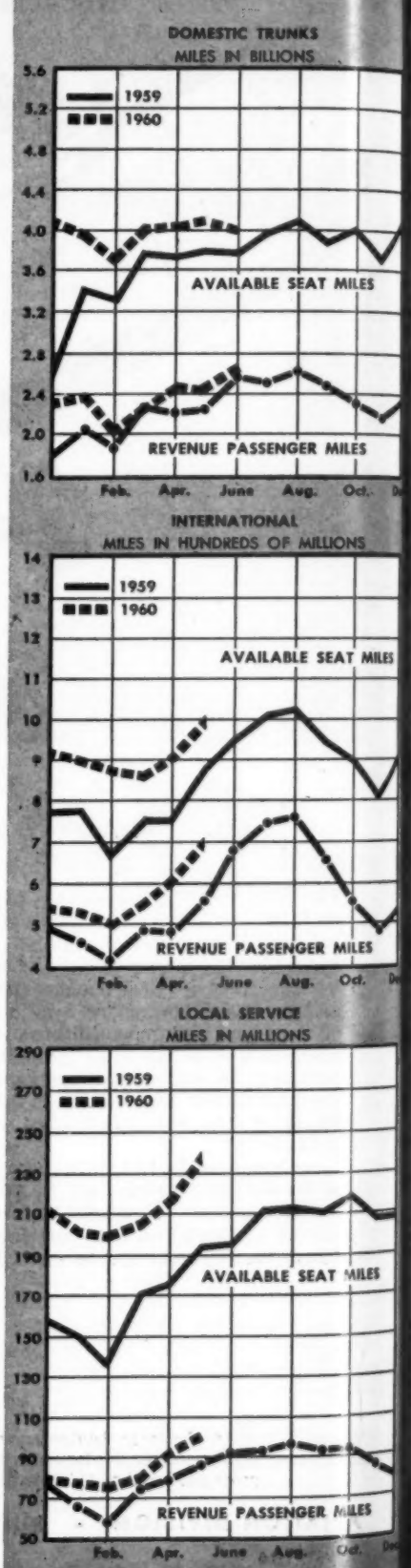
The increase in 1959 was 15%, but this figure was inflated by the rash of strikes in late 1958. Some forecasters predicted a 12% gain in 1960. But the passenger-mile total of 14.44 billion for the first six months was up only 7.6%, while seat-miles of 24.14 billion increased 10.4% and load factor fell from 61.29% to 59.81%. In the first half of 1959, business was 11.1% ahead of 1958.

June, a peak month, was only 3.4% over last year, and the gain was due entirely to coach (see opposite page). Passenger-miles of 2.7 billion and seat-miles of 4.05 billion produced load factor of 66.75%, up 7.75 points from May but 1.38 points below June, 1959.

Compared with the first half of 1959, which showed fairly steady increases over 1958, the first six months of 1960 fluctuated: January, up 17.3% but inflated by the strikes; February, up 12%; March, down 1%; April, up 10.8%; May, slackening off to a 6.5% gain, and June even lower at 3.4%.

Reasons for the disappointing showing are somewhat nebulous. One observer points out that the level of general business in the U.S. is deceiving—it's not uniformly good and some industries, such as steel, are "flat."

HOW'S TRAFFIC
Among U.S. Airlines



Coach Pulls Abreast of First Class

U.S. Airline Traffic for May, 1960 vs. 1959

This complete summary compiled by AIRLIFT Magazine from Official CAB data.

	Revenue Passengers (000)			Revenue Passenger Miles (000)		
	1960	1959	% Change	1960	1959	% Change
DOMESTIC						
American	718	659	9.0	531,949	463,829	14.7
Braniff	198	183	8.2	93,615	79,835	17.3
Capital	319	327	— 2.4	129,947	134,159	— 3.1
Continental	113	85	32.9	73,069	41,556	75.8
Delta	290	261	11.1	154,166	127,191	21.2
Eastern	668	700	— 4.6	340,078	360,128	— 5.6
National	126	133	— 5.3	74,704	78,913	— 5.3
Northeast	118	101	16.8	43,255	39,982	8.2
Northwest	157	150	4.7	107,464	111,953	— 4.0
Trans World	440	439	0.2	373,836	377,289	— 0.9
United	655	601	9.0	449,862	415,525	8.3
Western	130	121	7.4	69,357	63,530	9.2
	3,932	3,760	4.6	2,441,302	2,293,890	6.4
INTERNATIONAL						
American	8	8	....	7,927	7,850	1.0
Braniff	5	4	25.0	10,520	7,781	35.2
Caribair	32	23	39.1	2,165	1,583	36.8
Delta	3	5	—40.0	3,629	5,748	—36.9
Eastern, Overseas	42	33	27.3	59,976	47,143	27.2
San Juan	33	25	32.0	50,514	37,987	33.0
Bermuda	5	4	25.0	3,729	3,549	5.1
Mexico	4	4	....	5,733	5,607	2.2
National	2	6	—66.7	1,545	4,448	—65.3
Northwest	16	14	14.3	28,953	31,567	— 8.3
Hawaiian	2	2	....	4,406	5,494	—19.8
Panagra	10	10	....	14,375	14,069	2.2
Pan American, System	254	251	1.2	406,704	381,887	6.5
Latin American	84	97	—13.4	103,886	107,765	— 3.6
Atlantic	129	123	4.9	175,519	162,132	8.3
Pacific	35	27	29.6	120,602	107,622	12.1
PDX/SEA-HON.	3	1	200.0	7,912	3,902	102.8
Alaska	6	4	50.0	6,697	4,368	53.3
Trans Caribbean	12	6	100.0	18,175	10,351	75.6
Trans World	40	34	17.6	114,208	102,611	11.3
United	12	10	20.0	30,074	23,894	25.9
Western	5	3	66.7	7,122	5,303	34.3
	441	407	8.4	705,373	644,235	9.5
LOCAL SERVICE						
Allegheny	59	48	22.9	11,586	8,258	40.3
Bonanza	21	19	10.5	5,171	4,610	12.2
Central	15	16	— 6.3	2,912	2,978	— 2.2
Frontier	28	24	16.7	7,311	6,042	21.0
Lake Central	21	20	5.0	3,439	3,300	4.2
Mohawk	52	51	2.0	10,225	9,788	4.5
North Central	81	81	....	14,182	14,299	— 0.8
Ozark	52	50	4.0	9,139	8,652	5.6
Pacific	44	39	12.8	10,131	8,676	16.8
Piedmont	42	44	— 4.5	8,919	9,384	— 4.9
Southern	31	23	34.8	5,600	4,050	38.3
Trans-Texas	29	23	26.1	6,745	5,585	20.8
West Coast	34	29	17.2	7,996	5,462	46.4
	509	467	9.0	103,356	91,084	13.5
HELICOPTERS						
Chicago	30	17	76.5	501	315	59.0
Los Angeles	4	4	....	124	130	— 4.6
New York	13	13	....	267	239	11.7
	47	34	38.2	892	684	30.4
INTRA HAWAII						
Aloha	28	17	64.7	4,032	2,322	73.6
Hawaiian	40	38	5.3	8,842	5,604	57.8
	68	55	23.6	12,874	7,926	62.4
ALASKA						
Alaska	11	10	10.0	8,690	9,411	— 8.3
Alaska Coastal	6	6	....	597	588	1.5
Cordova	2	1	100.0	306	214	43.0
Ellis	6	6	....	410	401	2.2
Nor. Consolidated	3	2	50.0	842	742	13.5
Pacific Northern	11	11	....	11,134	10,650	4.5
Reeve	2	2	....	1,611	1,262	27.6
Wien	4	3	33.3	1,244	1,069	16.3
	45	41	9.8	24,834	24,337	2.0

AIR CARGO

(Ton miles in thousands)

	Freight			Total Scheduled		
	1960	1959	% Change	1960	1959	% Change
AAXICO	.....	185,584	....	.....	201,354	....
Flying Tiger	6,275,595	6,997,111	—10.3	6,378,919	7,101,737	—10.2
Riddle	1,835,464	1,780,975	3.1	1,894,131	1,823,484	3.8
Slick (C)	.....	.....	....	.....	.....	....
Aerovias Sud	429,819	550,427	—21.9	429,819	550,427	—21.9
Seaboard & Western	1,963,823	2,205,190	—10.9	2,381,810	2,696,742	—11.7
	10,504,693	11,719,287	—10.4	11,084,679	12,373,744	—10.4

Note: Hawaiian Airlines figures are scheduled services only. All others are all services.

The inevitable shift is here. Domestic trunk coach traffic is forging ahead of first-class. Experts think it will stay ahead. Big factor is the jet transport.

In June, the two classes of traffic were so close that Air Transport Assn. rounded off the figures and reported 1.35 billion passenger-miles for each. Actual totals were 1,354,087,000 first-class and 1,349,616,000 coach, a difference of only 4.4 million. Coach was 49.91% of total (full year 1959 showed 43.6%).

Low-fare service has been the lifesaver in keeping passenger-mile totals up. June was a good example: coach up 16.3% over the same 1959 month, first-class down 6.8%. Result: an overall increase of 3.4%.

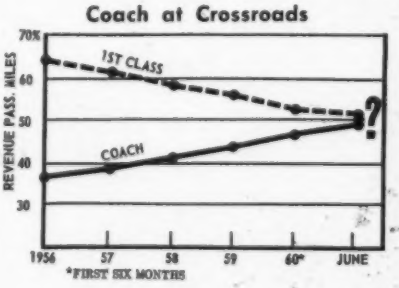
Jets hastened the day of the shift. Formerly, most coach flights operated off-peak, made more stops. Combination jets changed this, and the "mix" of the seats this summer is predominantly coach (American, 44 first 74 coach on Boeing 707s, United 44-65 and Eastern 40-75 on DC-8s). The cheaper service isn't attracting only personal travel; more and more business riders are changing.

A look at June shows 1.35 billion coach passenger-miles and 1.86 billion available seat-miles for load factor of 72.51%, down half a point from last year. First-class dropped 2.5 points to 61.85%, with 1.35 billion passenger-miles and 2.19 billion seat-miles.

Three transcontinentals, American, TWA and United, had lower load factors in both services than in June, 1959—65.9% first-class against 73.8%, and 79.3% coach against 85.3%. But the nine other trunks gained in both categories—75.5% vs 55.7% and 64% vs 60.9%, respectively.

In 1960's first half, coach passenger-miles of 6.7 billion were 18.7% ahead of 1959; seat-miles of 10.66 billion were up 18.1%. Compare this with first-class: no increase in passenger-miles (7.74 billion), a 4.9% gain in seat-miles (13.5 billion).

Coach at Crossroads



BENDIX BRAKES—

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Bendix PRODUCTS DIVISION South Bend, IND.

Who's Buying What in Noise Mufflers

Opinions vary widely among operators in this new era of ground equipment forced into being by jets. AIRLIFT surveys the field and reports the results

Jet run-up noise suppressors, a new family of fixtures for airline maintenance, are bucking a mixed-reception among the operators of big turbine transports.

Only a handful of suppliers have cracked the market to date. Some airlines have bought nothing. And among the buyers, there is a widely varying range of satisfaction (sometimes outright dissatisfaction) with the results.

According to Martin Hirschorn, president of Industrial Acoustics Co., leading U.S. supplier, more wide-scale use of suppressors is being hamstrung from two sources. Operators are uncertain as to the meaning of airport specifications on community noise and they lack intimate knowledge of the capabilities of available equipment.

Noise specs are confusing

On the airport issue, Hirschorn points to the difference between specs at Idlewild and Los Angeles, the two busiest and noisiest jet airports in the U.S. Idlewild's spec works out to a limit of 84 PNdb from 7 a.m. to 5 p.m.; 82 PNdb from 5 to 10 p.m. and 77 PNdb from 10 p.m. to 7 a.m. At Los Angeles the limit is equal to 60 PNdb.

Who is buying what in suppressors? An exclusive *AIRLIFT* survey of major U.S. and foreign airlines reveals this mixture of non-buyers, present users and interesterted parties.

Some airlines use nothing

KLM uses no ground noise suppressors. Neither does Sabena, Braniff or Eastern, although EAL's v.p.-engineering Charles Froesch reports the carrier undoubtedly will have to buy some when its DC-8 operation expands over the coming months.

American to date has bought only one muffler, built by Kittell-Lacy, El Monte, Calif., which is used at Los Angeles for maintenance runups. Such operations at other stations are at a minimum, so no mufflers are needed.

AA feels its unit is doing the job in meeting the LAX decibel standard. However, it says it is always looking for something better and is considering any number of other designs for future use. But a decision is not imminent.

As at American, TWA employs a Kittell-Lacey unit at Los Angeles. A. N. Knudsen, director of facilities planning, says that inlet suppression combined with proper orientation (pointing the aircraft towards the community) has virtually eliminated complaints.

At Idlewild, TWA relies on the right orientation plus hangar shielding for very effective suppression. To date it has not received a run-up complaint.

NG at Idlewild, OK out west

Pan American has invested in two suppressors, a Model JEC-10 exhaust unit and JIC-SBEN intake unit, both built by Maxim Silencer Corp., Hartford, Conn. Although initially procured for use at Idlewild, the supressors fell short of PAA's expectations. Fortunately, Pan Am found an alternative use, shipping them to San Francisco to muffle a portable jet engine testbed.

PAA engineers set down three requirements for truly portable ground suppressors, (1) they must be sufficiently effective to provide "ear" appreciation as well as a reduction in decibels; (2) they must be easily handled, maneuverable and flexible enough

Intake suppressor built by Koppers Co., Inc. for Continental hushes compressor whine by 15 db within 10 to 12 ft. of operating engine.

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to be used on all the customers' aircraft without affecting engine performance; and, (3) they should be self-sustaining or anchoring without need for elaborate ramp modifications. They must go to the airplane rather than the airplane to them.

Continental has procured one ground suppressor, a Koppers (Baltimore, Md.) intake unit, and is now studying a Koppers exhaust suppressor but a decision has not been reached. The intake unit is used for base maintenance at Los Angeles to protect ground personnel. CAL tests show that at 1,000 ft. it provides only a negligible noise reduction and therefore is no solution to the community noise problem.

Down with the decibels

The Koppers unit cuts the intake whine by 15 decibels within 10 to 12 ft. of an operating engine and nine to 10 decibels at 250 ft., according to tests at Los Angeles. The unit is a 10′ 5″ high, 6′ 2″ wide and 8′ long box mounted on casters with an open end that rolls up about flush with the jet intake.

Another box-like intake suppressor, the Industrial Acoustics Model U810-P was tested recently by Pan Am at Idlewild. IAC Report No. 76, recently issued, reports reduction of 15db below that of bare engine noise using the U810-P screen.

United, biggest U.S. user of ground suppressors, has three exhaust units and one inlet suppressor. Two exhaust units are Industrial Acoustics (New York) Model 45-270. A third exhaust unit is General Acoustics Co. (Los Angeles) Model AE-15 and the inlet muffler, also General Acoustics, is Model AI-59.

All units are based at Los Angeles, except for one Industrial Acoustics' suppressor assigned to San Francisco. Like other carriers, UAL feels that sound attenuation isn't 100% satisfactory and installation time overly long considering that runup takes only several minutes.

BOAC has bought eight units to date, all from Cullum Detuners Ltd. of London. Four are Model BC/F1 used with Comet jets, the other four BC/F2 for Boeing 707s. BOAC says the units have performed satisfactorily in meeting Ministry of Aviation requirements at London Airport.

Delta Air Lines owns four Koppers KAN425 inlet suppressors mounted on ½-ton Ford pickup trucks for use at its Atlanta jet overhaul base. Delta backs the suppressors up to the intakes during ground running and feels they have proven only mildly effective.

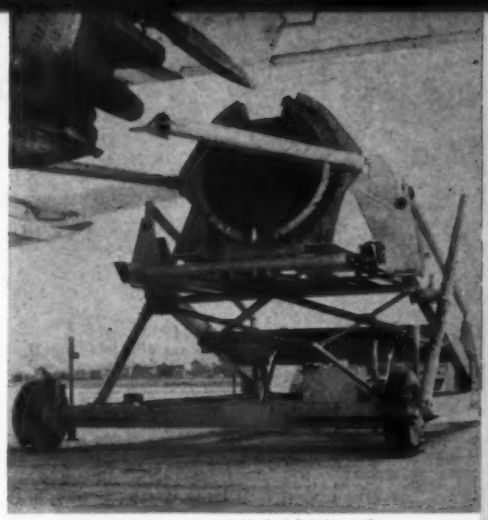
However, Campbell Floyd, DAL's supervisor of tooling and facilities, feels suppressors are not wholly adequate as a complete muffling of jet engine noise would affect engine performance to such a degree as to render satisfactory ground testing impossible.

Floyd says several suppressor manufacturers are working on a more effective system. Because of the newness of the development, a completely adequate system is not yet complete.

Quiet as a Paris street

At Air France, six units of two types of suppressors are in use. For Caravelles, AF employs a design developed by the French firm Bertin which cuts engine noise by 39 db. At 1,000 ft. away, Caravelle engines operating at full power produce 85 db, about equal to the overall sound pressure level of an average busy Paris street. For its Boeing 707s, Air France uses four Industrial Acoustics' suppressors. All equipment is based at the carrier's Orly Airport base.

Most active of all the airlines in suppressor development and evaluation are the combine of Swissair and SAS.



Industrial Acoustics

Industrial Acoustics' universal jet noise suppressor used by United Air Lines weighs less than 3,500 lbs.

They have worked out joint specifications and have ordered two types for evaluation, one from J. R. Andersson & Co. Sweden and the other from Cullum Detuners.

According to SAS engineer Sven Pettersson, both models appear to meet the specs but the carriers will run their own tests and will select a final standard based on the outcome. Their total requirement is for about 16 units for base and line operations.

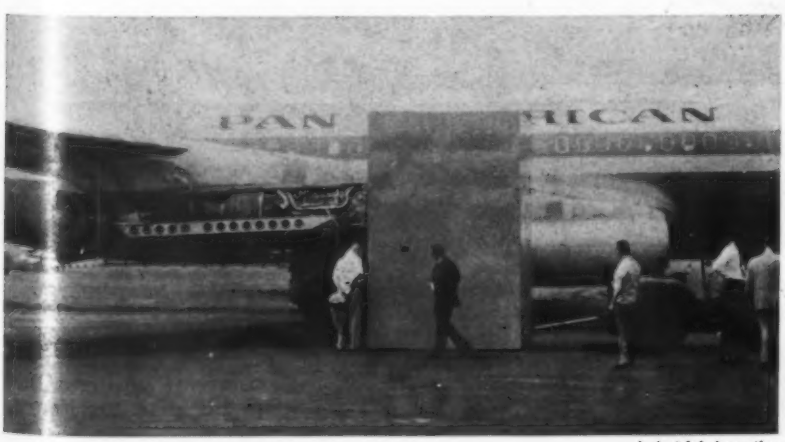
The Swissair activity involves three Cullum units on order, one for DC-8s and two for Caravelles.

Prior to the current evaluation project, SAS built its own noise suppressor for the Caravelle. It also holds the distinction of operating the most elaborate noise suppression installation in the industry, the so-called "hush-house" at Bromma Airport which encloses the entire tail section and engines of the Caravelle and cuts noise level by 40 db.

Pettersson says the SAS-Swissair view is that so-called mobile, silencers are impractical. Usually weighing well above five tons, they are difficult to move and juggle into position. Instead, the preference is for fixed run-up positions to which the airplane is towed and the silencer then moved into position. No fixed attachments are desired between the exhaust outlet and silencer.

In addition to noise suppression, particular attention is paid to ease of handling. With some present equipment, Pettersson says, it will take hours before a crew can run-up an engine. The SAS-Swissair spec calls for 15 minutes or less.

As to inlet suppression, the carriers have yet to find design which they will approve. When such a unit becomes available, they plan to use it in some cases in connection with ground running.



Industrial Acoustics

Pan American test out Industrial Acoustics' intake suppressor at Idlewild. It is quite similar in appearance to unit used by Continental (page 43).

A New Way to Load Cargo

Canadair has nailed down system design which two airlines are expected to buy

One of the most over-discussed and under-developed areas of air cargo—the mechanization of ground loading—is finally headed for the hardware stage.

Canadair Ltd., builder of the first turbine-powered, all-cargo aircraft to sell on the commercial market, has come up with a system for its swing-tail CL-44. Although it isn't official yet, both Seaboard & Western and Flying Tigers are expected to buy it.

The mechanized system, which cuts turnaround time for the big turboprop to one hour, is new in concept. It combines a lightweight, aluminum-faced plywood pallet with special fuselage floor skid strips to do the job.

During loading operations, aluminum strips riveted to the underside of the pallet slide along dry-lubricant impregnated nylon runners built into the aircraft floor. In Canadair tests with sand scattered on the floor, friction coefficients as low as 0.13 and 0.15 have been recorded consistently.

The pallet itself weighs only 140 lbs. and is only ½-inch thick, a surprising dimension considering its 10 1/6-ft. width and 7 5/12-ft. length. Each pallet is rated for a capacity load of 8,000 lbs.

To expedite pallet loading, Canadair simultaneously is developing a cargo transfer platform that attaches to the airplane as soon as the tail is swung. It uses a conventional roller-conveyor as a bed that is set slightly above the aircraft floor level.

The preloaded pallet is set on the platform by forklift and manually moved forward until about one-third of the pallet length extends inside the fuselage. Then, spring-loaded hook carriers powered by a chain and cable system automatically engage fittings on the pallet and pull it to the desired position in the aircraft.

Canadair

How Canadair pallet fits into CL-44. Strips on fuselage floor are nylon runners.

A lower level on the transfer platform is designed to handle cargo bins or containers for loading underfloor compartments. Both the lower deck of the platform and the aircraft compartment floors have ball and roller conveyers to assist cargo movement.

A safety feature of the platform in the form of a ball-joint and self-levelling jack compensates for aircraft deflection in any direction during loading.

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Transition to 340s In 21,964 Hrs.

North Central Airlines, with the first year of Convair 340 operation under its belt, credits a thorough, smooth training program for the highly successful changeover from an "all DC-3" service.

The No. 1 local airline managed to realize an average utilization of 6 hrs. 28 min. a day for the first 12 months of operation with a 95.88% schedule completion factor. This utility exceeds averages recorded by most other locals in the introduction of new aircraft, in some instances by more than an hour, North Central officials say.

In all, North Central figures its basic 340 transition totaled 21,964 hrs. with 755 employes receiving 20,517 manhours of class instruction and 1,447 hours in flight.

Here's how individual departments planned the instruction program: *Pilots*—Flight manual preparation commenced 10 months before start of service. Two months before first airplane delivery, four supervisory training pilots underwent three-week training, including one week flying as observer in Continental Air Lines line operation.

Fifty captains and copilots were given a total 2,000 hrs. ground school and 425 hrs. flight time and each pilot rode jump seat for 20 to 25 hrs. to observe Convair operation.

Maintenance—285 maintenance and engineering personnel were given 14,872 hours ground instruction with 11,520 hrs. going to 218 mechanics. Thirty-eight radio mechanics received 2,920 hours instruction on Convair electronics and 25 ground service men totaled 200 hrs. class instruction.

Station Operations—279 station personnel received 591 hours ground school including a visit of the Convair to each station for several hours of practical demonstration. As follow up at later date, regional superintendents visited each station for 100 hrs. of classroom sessions.

Stores—Eight personnel received 104 hrs. instruction on Convair parts and equipment. North Central also planned a subsequent two-day course for 28 to 30 additional stores personnel.

A big factor in holding the cost of North Central transitional training to a minimum was the timely availability of an abandoned elementary school nearby its headquarters at Wold-Chamberlain Airport.

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Bendix Eyes Sprouting Doppler Market

Sales picture for radar navigation system looks bright indeed as airlines move ahead with evaluation testing

A potential for "hundreds" of doppler radar orders stemming from favorable evaluation reports by prospective users may give Bendix Radio Division a big lead as carriers start the shift to this latest self-contained electronic navaid this fall.

United Air Lines has eight units—five installed and three spares—which it is testing out in overwater DC-8 flights between the west coast and Hawaii. Although airline officials won't go on record wholeheartedly until after they have had a chance to use the doppler system with its companion computer—sometime in September—early reports are they like it.

TWA also is evaluating a unit in a 707, while the USAF has a C-130 rig and Pan American one in a 707.

Most significant, however, may be Lufthansa's verdict. The German carrier is dickering not only for its own fleet, but for Air Union brothers Alitalia, Sabena and Air France as well.

Just around the corner

Aviation products sales manager H. A. Wolf feels that doppler radar is a navaid which is just about to hatch. The airlines have been evaluating Bendix units for just under a year. Wolf feels certain the trial period is near an end. He expects firm orders to shape up as the fall months wear on.

He cites as justification the way the airlines now refer to "hundreds" of units instead of just a dozen or so. The major carriers have not yet made a major purchase—except for United's sampling—but Wolf is convinced the time for decision is ripe.

Already firm is an order from the German Air Ministry for 67 DRA-12 installations on Fiat G-91 fighters, soon to be the mainstay of NATO countries in Europe.

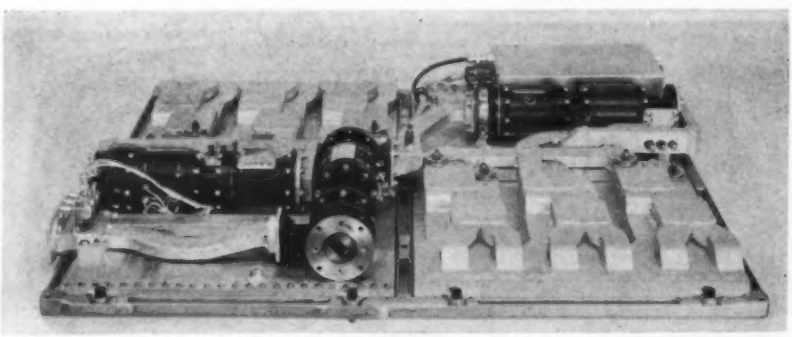
Bendix interest in doppler dates back to the summer of 1957, when the military classification was lifted. Three months of theoretical analysis were followed in January, 1958 by a firm decision on operating parameters. It only remained to develop the circuits to match these parameters.

As finally evolved, the Bendix system utilizes a stationary antenna with four downward-oriented beams, operating at 8800 megacycles. In its simplest form it provides a direct readout of ground speed and drift angle on a standard cockpit indicator.

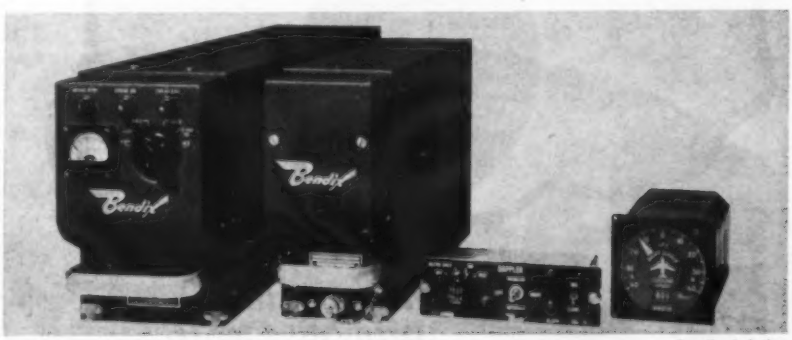
In its more complex mode, it combines the functions of the basic unit with a navigation computer to provide a continuous and automatic indication of distance to go and distance left or right of a selected track.

Doppler product engineer Carl Bath reports that Bendix chose FM/CW modulation because of the low power consumption and circuit simplicity of such a system. It is used with synchronous demodulation to provide reliable performance in a relatively small package.

The system will operate up to 50,000 ft. with a 12 db safety margin for



Two antenna units are shown joined at the center. Each unit functions as transmitter and receiver array for two beams. Switches and waveguide are attached.



Bendix Aviation

Basic DRA-12 navigation system is comprised (left to right) of DRA-12A tracker unit, RTA-12A transmitter/receiver, CNA-12A control box and INA-12A indicator.

operation over smooth sea. Bath points proudly to a circuit innovation which permits the tracker to function satisfactorily with signals as much as 30 db below the noise.

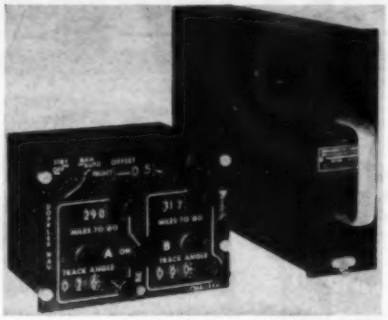
The unit is completely transistorized, except for the klystron transmitter tube and three gas regulator tubes in the power supply. The result: small size, light weight, reliability (transistors don't wear out, like vacuum tubes) and a drastic drop in power consumption. Basic system weight is 57 lbs.

The DRA-12 consists of the ANA-12 antenna, RTA-12A transmitter/receiver (on one chassis) and DRA-12A tracker unit, in the equipment rack, and INA-12A indicator and CNA-12A control unit in the cockpit. Cost of this basic system is around $16,500, plus assorted shock mounts and other installation accessories.

Computer weighs 12 lbs.

Adding the Bendix CPA-24 navigation computer system adds roughly $9,000 and another 12.4 lbs. It also does away with considerable drudgery in the cockpit, by reducing navigation to an automated routine.

The computer is in two pieces: the CPA-24A computer and the CNA-24A computer controller, which goes in the cockpit.



Bendix Aviation

CPA-24 computer system includes CNA-24A controller (left) and CPA-24A computer.

The controller actually is a dual unit, with two identical sets of readouts for miles to go and track angle. What happens is that side A is used for the first leg while side B is readied for leg no. 2. At the turning point, the unit is flipped from A to B, and side A reset for leg no. 3.

Other computers will, of course, work with the basic DRA-12 system, though connections will differ.

Bendix officials glow when they describe their antenna, by itself a skinny ¾ in. thin. Adding the waveguide and ferrite switching assemblies does fatten it up a bit, though the whole never exceeds 3½ in.

It's a four-beam planar array rigidly affixed to the aircraft. Flexible construction permits either a squarish configuration, with the two antenna units side by side, or an elongated rectangle, with the units end to end. If space is cramped the ferrite switches can be positioned elsewhere.

The indicator is a standard 3-in. instrument, integrally lighted, with a flag alarm and warning light. It provides a dial-type presentation for drift angle up to plus or minus 40 degrees, and a three-drum digital display for ground speed up to 999 knots.

The control unit is designed for installation in the overhead panel, and includes a function switch, a LAND-SEA switch, and a servo-slewing control, plus a test switch for in-flight testing. The in-flight test will give an accurate indication of system performance on everything but the klystron, antenna and switches.

Constant in-flight monitor

Another form of in-flight check is functioning constantly. The fourth beam (only three are needed for navigation) supplies an extra frequency combination which will trigger the malfunction flag if it exceeds normal tolerances.

Bendix is just now gearing for production. All DRA-12s now undergoing evaluation are pre-production models. The first computers won't be delivered until September.

When production eventually is stabilized, Bendix hopes to turn out something over one a day, or 25 a month.

Bath has been very pleased with the doppler unit's stability. One has been in operation more than 2,000 hours without breakdown. No transistor failures have as yet appeared, Bath says, and reports only one capacitor and one potentiometer failure to mar an otherwise perfect record.

In fact, he points out, engineers at Baltimore consider the DRA-12 the easiest new piece of equipment to service that Bendix has ever set out to build. One clue to this easy serviceability is the way the sub-assembly boards can be removed quickly and individually checked.

Should a unit fail in flight, it's relatively simple to determine the general area of malfunction. The quick cure calls for replacement of the entire black box.

Back in the shop, narrowing the defect to a particular component is facilitated by three test units specifically developed for the doppler system. Bendix also has a ramp tester which can be wheeled out to the airplane for a quick rundown from the ground.

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Sir Matthew Slattery appointed full-time chairman of BOAC, succeeding **Sir Gerard d'Erlanger,** who resigned because of business commitments. Sir Matthew has been chairman of Short and Harlands. **Sir Wilfred Neden,** BOAC board member, named part-time deputy chairman.

Walter Sternberg, airline consultant and a director of South Pacific Airlines, retained by Mohawk as sales consultant. **Russell V. Stephenson** transfers from v.p.-personnel to newly-created post of v.p.-customer service. **Harvey P. Barnard,** formerly Frontier's v.p.-maintenance and operations, takes over Stephenson's old position.

Cecil W. Moore, former asst. to v.p.-traffic and sales of Pan American, elected asst. v.p.-traffic and sales administration. **Warren A. Pine Jr.,** who has been PAA's managing director for Cuba, named development director for Latin America.

M. Ben-Ari promoted from director of sales of El Al to deputy managing director (commercial), based in Tel Aviv.

Capt. George D. Cheetham, 22-year veteran pilot with Braniff, appointed system chief pilot. **Capt. M. G. Safrit** promoted to asst. system chief pilot and **Capt. James W. Peckham** to asst. chief pilot.

Three Piedmont pilots promoted to newly-created posts in operations dept.: **W. O. Tadlock,** director of flight operations; **L. W. McNames,** director of flight standards; **F. C. Nicholson,** administrative asst. to v.p.-operations.

Gene Lott, formerly with Frontier, named chief engineer of Pacific Air Lines.

Wayne Lydon, former supt. of maintenance for Continental, appointed asst. to v.p.-maintenance of West Coast.

William Bailey, formerly with The Martin Co. and one-time airline economist, named director of route development of Continental.

M. L. Lapensky, Northwest's director of economic planning, elected comptroller.

Phil Fellows promoted from mgr.-traffic services of Eastern to asst. director-traffic services.

Roy Thorpe, mgr. of agency and interline sales of SAS Inc., appointed to the president's staff as director of service standards, a new post.

M. L. Muse resigned as Trans-Texas' secretary-treasurer. **Herman Farr** appointed acting asst. treasurer, **R. E. McKaughan Jr.** named corporate secretary.

H. Fletcher Brown, who has been asst. gen. mgr. of Lockheed's Georgia Div., named v.p. and asst. to the president of Lockheed Aircraft Service and Lockheed Aircraft Service-New York, based in Ontario, Calif.

Frederick W. Hornbruch Jr., executive committee chairman of Titeflex Inc., elected president and chief executive officer.

William M. O'Hern resigned as United Air Lines' publicity director to become corporate director of public relations for Lear Inc. **James V. Bitner Jr.,** formerly with the Martin Co., named asst. gen. mgr. of Lear's Instrument Div.

Richard E. Weymouth, former mgr. of General Electric's Caravelle program, named mgr. of applications engineering at GE's commercial engine operation, responsible for investigating future applications for company's large commercial engines.

New appointments in aircraft engine operations at Allison Div. of General Motors: **R. H. Ludington,** jet engine sales supervisor; **R. E. Lowry,** small engine sales supervisor; **D. R. Orme,** supervisor of Aeroproducts sales; **J. D. Beaumont,** supervisor of prop-jet conversion engines; **R. W. Sherk,** parts mgr.; **L. W. Stear,** operations engineering mgr.; **C. E. Dixon,** service mgr.; **R. E. Tripplehorn,** technical services supervisor; **H. B. Frist,** commercial parts supervisor; **H. W. Korte,** field service supervisor; **L. Davidson,** commercial service supervisor; **E. W. Thompson,** commercial contracts supervisor.

Frederick P. Glazier, formerly v.p. of Laboratory Equipment Corp., joined Sun Oil Co. as special asst. in research and development div. and will be principal liaison for Sun with aviation and automotive industries.

Brian A. Wilson, with Bendix Filter Div. since 1959, named western region mgr., based in Van Nuys, Calif.

Dr. France B. Berger, former director of planning and requirements for GPL Div. of General Precision Inc., appointed director of research.

Joseph G. Liscouski Jr., formerly with Wright Aeronautical's service dept., named director of sales, service and engineering of S.M.S. Instruments and Accessories, Idlewild.

IN THE AGENCIES

John V. Tighe, who has been special asst. to FAA Deputy Administrator James T. Pyle, named special asst. to Administrator E. R. Quesada. Pyle's new asst. is **Robert V. Reynolds,** former chief of Region 4 general safety div., Los Angeles.

Four division chiefs were named for FAA's Bureau of Flight Standards in the regional offices: **Curtis A. McKay,** Region 1, New York; **George S. Moore,** Region 2, Ft. Worth; **Edward C. Marsh,** Region 3, Kansas City; **Burleigh Putnam Jr.,** Region 4, Los Angeles.

OTHERS IN AVIATION

Donald G. Shay promoted from supt. of operations to mgr. of Seattle-Tacoma International Airport, succeeding **Earle S. Bigler,** who retired from managing the field since its opening in 1949. **Robert M. Spicer,** senior security officer, is the new supt. of operations.

OBITUARIES

Fred M. Lanter, 60, director of FAA's Aeronautical Center at Oklahoma City, died of a heart ailment. Lanter joined the Commerce Dept. as an aeronautical inspector in 1929, served with CAA as general inspection division chief, asst. administrator for safety regulation, and Region 2 administrator.

Gerald A. Wynn-Wynne, 56, public relations officer-Americas for British Overseas Airways Corp., died of a heart attack. "Gerry Wynne," as he was known in aviation circles, took over as public relations head in the U.S. in 1945 after many years with Reuters and Hearst.

AIRLIFTS

• **Never let it be said** that E. O. "Oz" Cocke, TWA's senior v.p. and system general manager, isn't resourceful. He's now living in an apartment on Manhattan's east side, 16th floor (and growing a fine crop of tomatoes on the outside terrace this summer). One night recently he lost the picture on his TV set, but the sound remained. So he got his high-powered binoculars, searched nearby apartments until he found neighbors watching the same show, watched their picture long distance while listening to sound on his own set.

• **McIntyre of Eastern** may be setting history by ironing out problems that have plagued airlines and passengers alike but which no top management has stepped in heretofore to settle.

One is advance scheduling. Firm up the schedules far enough in advance so timetables, interline, internal and guides, all have the stuff and advance bookings can be made. Then no more changes in-between time except in emergency. It is believed McIntyre has been "sold" on the business practicalities.

Second, and this is in force: If weather at LaGuardia is marginal and scheduled to be marginal, up and down, Eastern doesn't wait. It shifts

(*Continued on page 54*)

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AIRLIFTS

(Continued from page 52)

all LaGuardia schedules to Idlewild for the period involved. It moves trucks, ticket stocks, employes, everything. It takes over the unused bank of counters at Idlewild, puts up a big sign that all LaGuardia schedules are being checked in there, and planes use idle ramp positions. Thus not one solitary normal Idlewild function is disturbed, not one Idlewild employe is bothered. And Idlewild still has all its trucks, ramp stuff, etc. When a customer calls to find out if his plane will depart he is told far in advance that it will leave from Idlewild, not LaGuardia. No guessing. Only a warning there might be some traffic delay.

• **At Idlewild all incoming baggage** passes by a hidden instrument (we won't mention the location) to detect radioactive matter. Whenever the device picks up any such material, it rings a bell and guards are alerted.

It would happen that a top airline man, Clyde Fullerton, TWA's v.p.-sales services, set off the alarm one day returning from overseas. And it took a terrific search to track down the cause. All baggage passing by at the same time was searched, with no results. Fullerton was unaware of what the trouble was until guards finally told him—the TWA v.p. had had an operation in which a radioactive substance was used and he, himself, had set off the alarm.

• **Time-saving techniques,** Our last call to one airline for a reservation brought this greeting (all in one breath) "TWA the superjet airline reservations are busy will you wait?" (Click).

• **Signs of the times?** Trans Australian Airways recently wrote to a British aircraft manufacturer. The reply began: "Your letter to our company, addressed to our engine company's main factory, comes to our holding company for attention and is being forwarded to our propeller company who are the prime contractors for pressurization units . . ."

• **For pilots only**—there's a new organization born awhile ago called the Fraternal Order of Air Mail Pilots. It meets every other week at the Coral Gables country club in Florida, has 54 charter members, all of whom are over 21 (that's one of the rules) with more than a year on their air mail log books. Founder and Lodge Chairman is Capt. E. C. Edelmann, an 18-year EAL veteran who meets the minimum requirements with ease. New memberships are invited, but are restricted to the U.S. and possessions.

• **How much** does a Parakeet weigh? 0.0606 lb. says Douglas Aircraft, and reveals the startling fact that the petit pet produces .219 cu. ft. per lb. per hr. of carbon dioxide. The data is found in a 23-page survey with the formidable title: "Standard charts for allowable loads of animals in class D baggage compartments." It's written for airline baggage and animal handlers, helps them compute the number of animals and birds they can safely pack into the sealed baggage compartments of the DC-8. Other calculated averages: Chihuahua, 6.15 lb.; Myhah bird, .184 lb.; Canary, .0359 lb.; Yellow-billed tropic bird, .875 lb.

• **Credit Pratt & Whitney** sales department with a clever news gimmick. Its bulletin "Commercial Jet Topics" has no regular schedule, is published "now and then" as the occasion demands. But bulletins are numbered so the customer knows he has them all.

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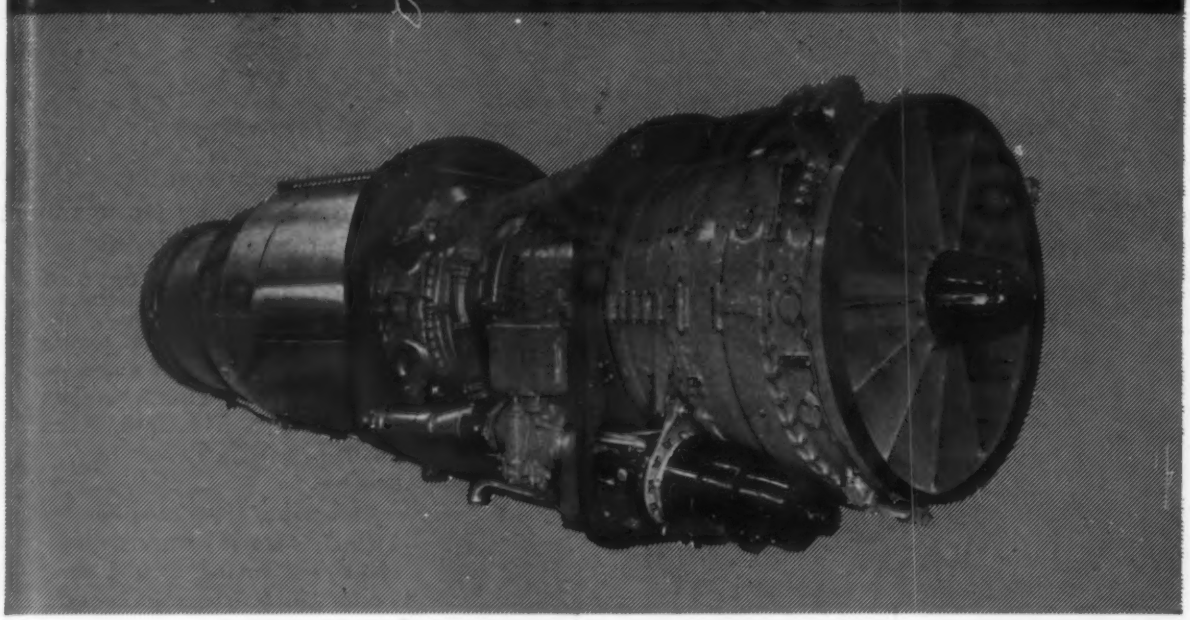


...ANOTHER ENGINEERING ADVANCE BY BRISTOL SIDDELEY

Security restrictions have just been lifted to permit the release of some details of the current Olympus version, the 21, which is now ready for production.

157-in long and with a 42-in intake diameter, the Bristol Siddeley Olympus 21 is Britain's most powerful military aero-engine. It inherits all the outstanding qualities of its forebears—high power at high altitude, unequalled handling characteristics, low fuel consumption and great operational flexibility. It also possesses the highest thrust/weight ratio of any high-thrust turbojet in the world.

The Olympus series of engines owes its excellent all-round performance to the two-spool compressor system, pioneered by Bristol Siddeley and since adopted by the leading aero-engine producers in Britain and the USA. Proof of Olympus reliability is given by the fact that it has the *longest achieved overhaul life*, the *lowest specific fuel consumption* and the *highest thrust* of any bomber or fighter engine in squadron service with the RAF.

The enormous development potential of the Olympus has repeatedly been proved. The first production version delivered 11,000-lb thrust dry, the current Olympus 21 has reached 20,000 lb, and an even later version is rated at no less than 33,000 lb with reheat.

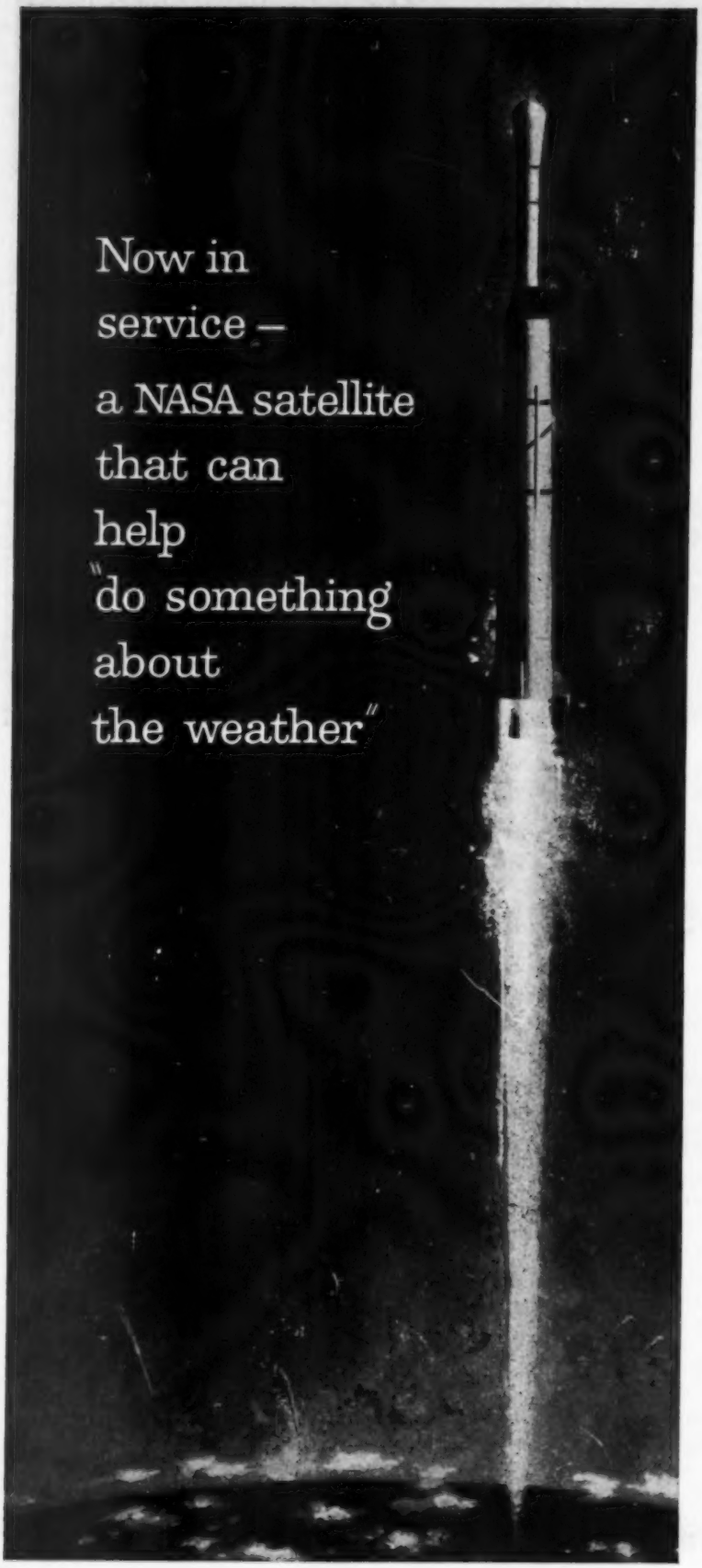
Olympus applications

The Olympus 201 already gives the Avro Vulcan B 2, spearhead of the RAF's V-bomber force, an all-round performance unsurpassed by any other aircraft of its type. The Olympus 21 has been designed to allow the Vulcan to reach its ultimate design potentialities.

The Bristol Siddeley Olympus is ideally suited to operation at transonic speeds and an advanced version has been selected to power the British Aircraft Corporation's TSR 2, a new tactical support/reconnaissance aircraft chosen for the RAF. Other Olympus versions are under active consideration for the next generation of civil airliners—the supersonic transports.

For further information please write to Bristol Aero-Industries Limited, 200 International Aviation Building, Montreal 3, Canada. Tel: University 6-5471.

BRISTOL SIDDELEY ENGINES LIMITED



Out of Space Age achievements by Government and Industry will come better living for everyone

Someday soon the art of weather forecasting will become more precise as the result of a network of meteorological satellites. Even weather *control* may become possible.

The first of these satellites, *Tiros I*, is already transmitting pictures of weather around the world. The booster that helped put it in orbit was a modified version of the reliable Douglas *Thor* IRBM. *Thor* is prime booster in the scientific "Discoverer" firings . . . has worked perfectly in over 85% of its space missions.

Thus the knowledge gained through the development of missiles has a useful peaceful application through NASA projects.

Thor is one more proof that Douglas' extensive experience in missiles is a national asset, and that nothing can substitute for the imagination, experience and skills which Douglas has accumulated in nearly 20 years of missile development.

TIROS (Television Infrared Observation Satellites) would serve weather observers—relaying information on cloud cover, temperatures, solar radiation

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New 'Buttons' for Push-Button Base

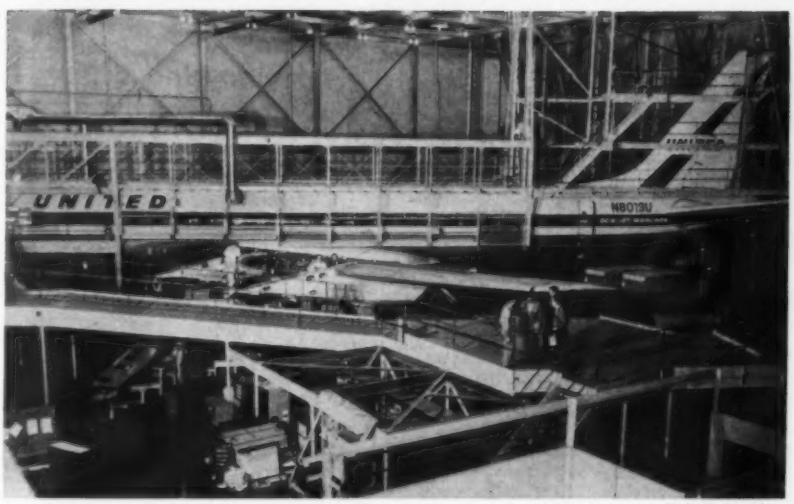
United Air Lines pioneers some major advances in airline maintenance for jets as first DC-8s roll in for overhaul

SAN FRANCISCO—United Air Lines, a 10-year veteran at push-button operation of an overhaul base, has come up with bigger and better "buttons" to do the job for jets.

From its brand spanking new DC-8 overhaul dock to a roomy, 120,000 sq. ft., $6-million turbine engine overhaul shop, United has spared no effort to come up with the best.

The DC-8 dock, which also accommodates the Boeing 720, is no doubt the most elaborate to grace an airline maintenance scene. Automatically-operated stands and walkways on the $193,000 fixture can be positioned exactly where needed to do the job. A 12-station intercom system, controlled from the cockpit while the airplane is in work, takes the frustration out of gear and control checks and speeds up the overhaul operation.

The intercom system was built for UAL by R. W. Neill Co., Chicago, but United leases it at $165 a month with 24-hr. a day service from Communications Engineering Co., Menlo Park, Calif.



United Air Lines

Most elaborate dock yet developed is UAL's answer to demands of jet efficiency. Building was planned in advance and fell a few feet short. DC-8 is "angled" in.

New washer, new grinder

In the turbine shop, a $320,000, 100-ton, fully-automatic parts washer built by Ransohoff Co., Hamilton, Ohio is capable of handling a peak load of 5.5 jet engines a day if United's output ever reaches that point.

Decked with elaborate push-button controls, it can separately process parts from both the hot and cold sections of the engine. Compressor or cold section parts are routed through a four-tank cold line. Combustor and turbine parts take the eight-tank route.

A master control panel permits selection of any tank in a cleaning cycle, priority movement of loads or by-passing of occupied tanks, all by means of an electro-mechanical memory system. The entire unit is operated by one man with the help of two cleaning personnel.

A revolution in the makeup of airline engine machine shops is marked by the appearance at UAL's base of a $106,000 vertical grinder and borer supplied by the Heald Machine Co., Worcester, Mass. Standing 15 ft. high and measuring 15 by 12 feet at its base, it can accommodate work up to 52 in. in diameter and 48 in. high.

UAL base officials make no secret of the fact that the Heald machine proved the difference between modifying all DC-8s to a higher thrust engine rating last summer and only reworking two-thirds of the aircraft.

Ultrasonics by Bendix

Among other jet shop innovations by United is a $4,000 fuel/oil heat exchanger cleaner developed by General Electric's Aircraft Apparatus Service Shop in Seattle. It is doing a highly commendable job, according to shop manager Sumner Youngblutt. Another is a battery of five ultrasonic cleaners in the accessory shop, supplied by Bendix Pioneer Central division.

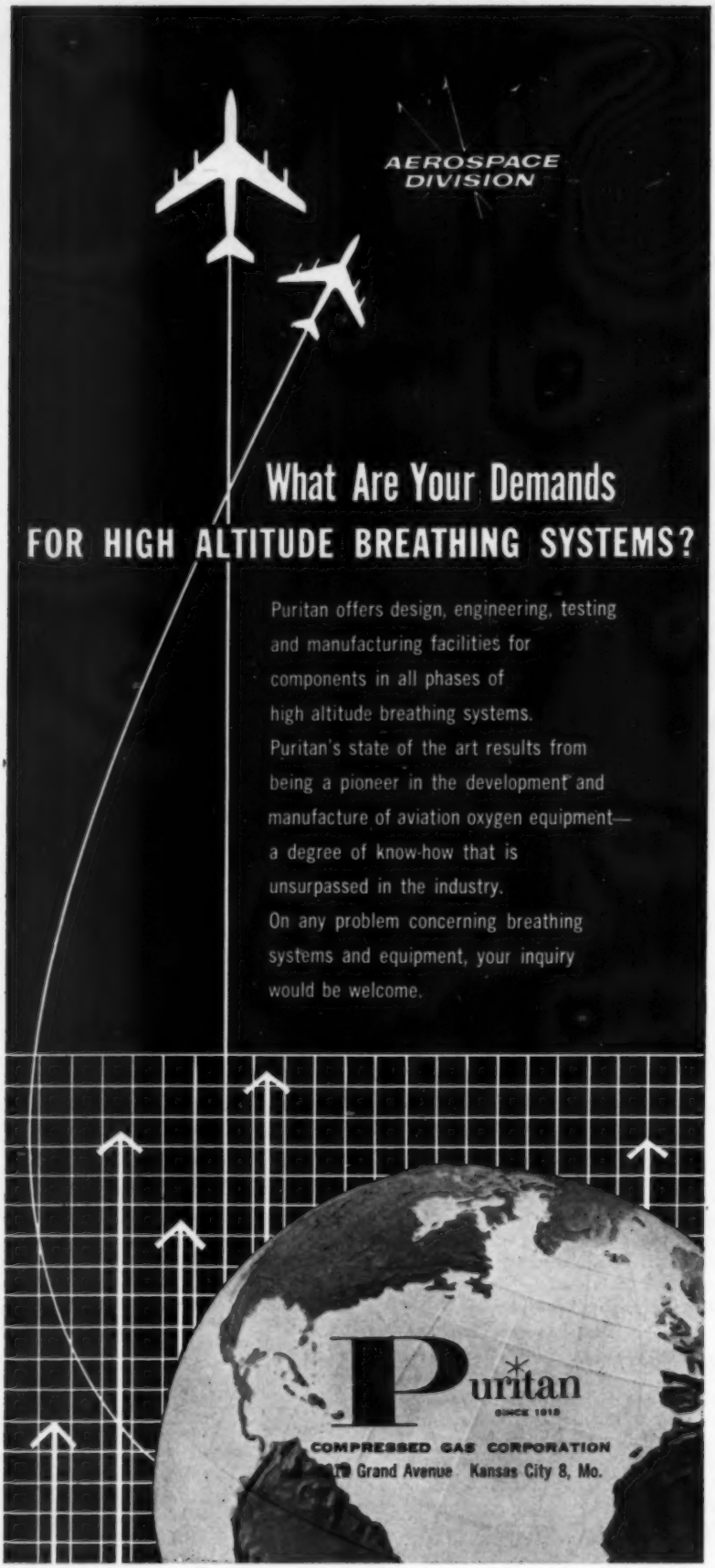
In engine shop output, United has been operating at the rate of one jet per day, but this month the pace steps up to about 1.5.

According to Youngblutt, UAL spent 2,800 manhours overhauling the first engine and by the 35th engine had cut this to 1,530. By the time it reaches its 1,000th engine, the goal is 1,000 manhours per overhaul.

Engine elapsed time through the shop began at 22.5 days and eventually UAL expects to reduce this to 13 days. To date, here's how overhaul manhours have been divided:

Inspection	178
Rotable Parts	191
Accessories	205
Repair/Test	10
Cleaning	75
Disassembly	157
Rework	102
Front Assembly	92
QEC Buildup	174
Pod Rework	276

In its DC-8 aircraft overhaul, United's learning curve calls for 10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days in the dock plus two on the ramp at the start. This will drop to nine-day dock time for the 2nd and 3rd aircraft, eight for the 4th, seven for the 5th, six for the 6th and five from that point on.

With a big fleet of 40 DC-8s on order, United took a good hard look at the prospects of altering the concept of routing aircraft to a base every 2,500 hrs. However, an exhaustive study showed that historically, there hasn't been a single airplane in its fleet that has gone for more than a year without needing one major modification that could not be divided up into smaller work segments.

On the DC-6 it was the spar cap and wing skin projects. On the Convair, airconditioning. On the whole UAL fleet, the airborne radar program. With the jets, there's no guarantee things will change and United's plan is geared to that philosophy.

$15 million in maintenance

With its full fleet operating, the carrier will have 37 DC-8s in scheduled service, one in overhaul and two undergoing line maintenance checks. As a good index of the cost of maintenance to an airline, this means $15 million in jets will be tied up in maintenance at all times.

As the first aircraft rolled out of the dock after its first base visit two weeks ago, this is how United had set up the initial manhour distribution:

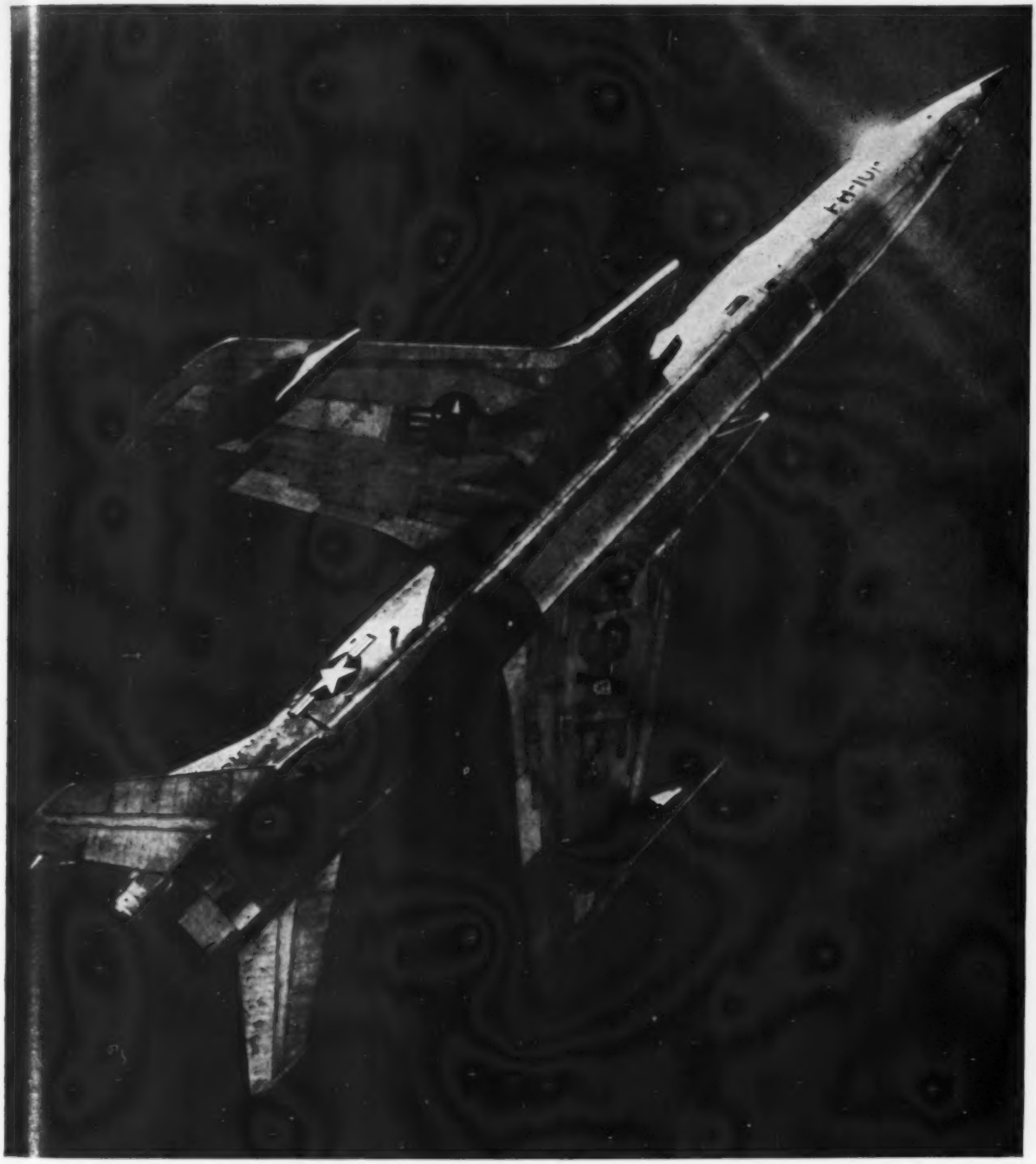
Work	Man-hours	% of Total
Routine Overhaul	6,150	38
Non Routine	3,960	25
Change Orders	3,570	22
Line Maint.		
Engine Check	360	2
Lead Man (overhaul)	1,440	9
Total Dock Work	15,480	96
Ramp Work	600	4
Total Overhaul	16,080	100

In all, 2,600 individual work cards were issued against the first airplane. United has devised a highly efficient system of work allocation on the jets, dividing the entire aircraft into specific one-man work stations.

Zone 119 is the nose wheel well on the DC-8 as well as the 720. Zone 219 is the control pedestal on both aircraft. Numbers in the 100 series are below the floor line, 200 above the floor and 300 in the tail section. Engine pod zones carry a 400 series.

Special zone diagrams for each aircraft are keyed to an engineering planning report for inspection of that aircraft. Report No. F-608, for example, covers the DC-8, No. F-720 covers the 720.

One of United's outstanding efforts



The Republic F-105D streaks to a new world speed record...

powered by a Pratt & Whitney Aircraft J-75 jet engine

On December 11, 1959, the Republic 105D fighter-bomber raced over the Mojave Desert at 38,000 feet. The course was a 62½ mile circle. With a temperature of 63 degrees below zero, the Air Force 105D whipped through the closed-course flight to establish a new world's record of 1,216.48 miles an hour. Its highly advanced electronics, radar, and associated equipment, enable the F-105D to perform missions at twice the speed of sound regardless of visibility, ceilings, or target area conditions. Its speed and power make it one of the most versatile aircraft in history.

The jet engine that powers the F-105D is the Pratt & Whitney Aircraft J-75. This same engine also powers Convair's F-106 all-weather interceptor which recently set a new world's straight-away record. Over the years, the Pratt & Whitney Aircraft J-57 and J-75 jet engines have broken virtually every major flight record.

PRATT & WHITNEY AIRCRAFT

East Hartford, Connecticut

A DIVISION OF UNITED AIRCRAFT CORPORATION

with the jets has been its ground equipment development program. Here the emphasis has been on developing items that could be used on both the DC-8 and 720. A special engine sling will do the job for both. So will a new engine shipping stand.

For towbars, United found the cost of available items ran anywhere from $650 to $1,000. It developed its own that cost only $450. As an example of cost saving, a tailpipe cover from Boeing for the 720 was pegged at $196. UAL came up with a special plastic type built by Thermoplastics, Inc. of San Carlos, Calif. for only $27.90 each.

Terminal base unbeatable

United's engineering and maintenance officials, from senior v.p. J. A. "Jack" Herlihy down the line, are convinced that having an overhaul base at a major terminal, such as United enjoys at San Francisco, is an unbeatable combination with jets.

Before the first jet hit the shop, base personnel had ample opportunity to work and train on them during a 500 manhour windshield rework that took 36 hrs. elapsed time to perform. Engine changes become simply a matter of routing the aircraft to SFO and the shop is right there to receive them. No ferries. No overland shipments. ■

Delta Base Boasts Advanced Hangar Design

Delta Air Lines

Now open for business is this new Atlanta overhaul base of Delta Air Lines. Note 420 ft. wide door opening made possible by cantilever construction. Doors are 48-ft. high.

One by one the major U.S. airlines are sprucing up their overhaul facilities to keep pace with the challenging efficiencies of new jets. And with each one, something new is added, whether it be improved mechanization, new shop tools, even a new hangar design.

Newest of these new facilities is Delta Air Lines 400,000-plus sq. ft. jet overhaul base in Atlanta which boasts several "firsts" in its hangar design. Built for Delta by Erwin-Newman Co., Houston, its cantilever hangar provides a clear span of 170-ft., longest of its type ever undertaken.

The 48-ft. high hangar doors represent the largest such steel units of a moveable variety in the U.S., possibly in the world. Covering 71,400 sq. ft., the 420 ft. by 170 ft. hangar will house three Douglas DC-8s simultaneously.

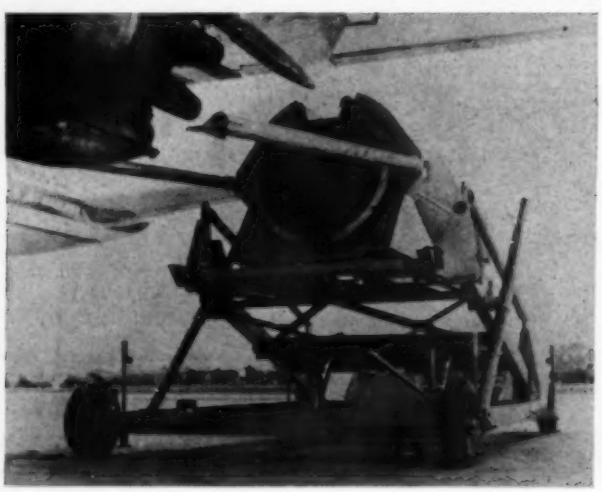
In all some 1,600 maintenance and stores personnel assigned to 45 departments of the base will take on virtually every overhaul operation required by the jets. Here's how Delta has parceled out work areas in planning the operating efficiency of the new facility:

Office or Shop	*Area (sq. ft.)*
Total area under roof	400,900
Hangar	71,400
Shops & Offices	
(1) First floor	50,400
(2) Second floor	40,400
Apron (400 x 420 ft.)	168,000
Stores (160 x 370 ft.)	59,200
Engine Shop (320 x 370 ft.)	116,000*
Utility Plant (60 x 90 ft.)	54,000
Drum Storage	7,000
Engine Test Cells (2)	9,700
Aircraft Wash Area (150 x 150 ft.)	22,500
Water Storage-Waste Treatment	3,890
Concrete Paving Uncovered	348,725
Asphalt Paving	656,235
Total Paved Area	1,004,960

Notes: (1) Includes production control, welding, parts repair, lobby, first aid, electrical inspection, wheels & brakes, tool room, painting, metal shop, cleaning, hydraulics.

(2) Includes class rooms, engineering, maintenance, inspection, stores, radio, instruments, production control, cabin interior shop.

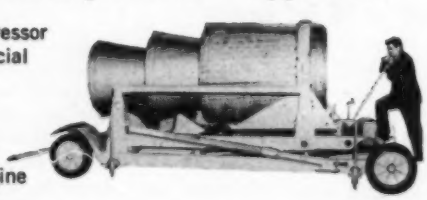
* Includes 15 sub-shop sections.



IAC

UDAC universal ground jet noise suppressor

The only Ground Jet Noise Suppressor especially developed for commercial jet transports and equally suitable for DC-8, 707 and Convair aircraft equipped with U. S. or British engines. Can either be directly attached to engine or anchored to the apron. Complete details furnished on request.



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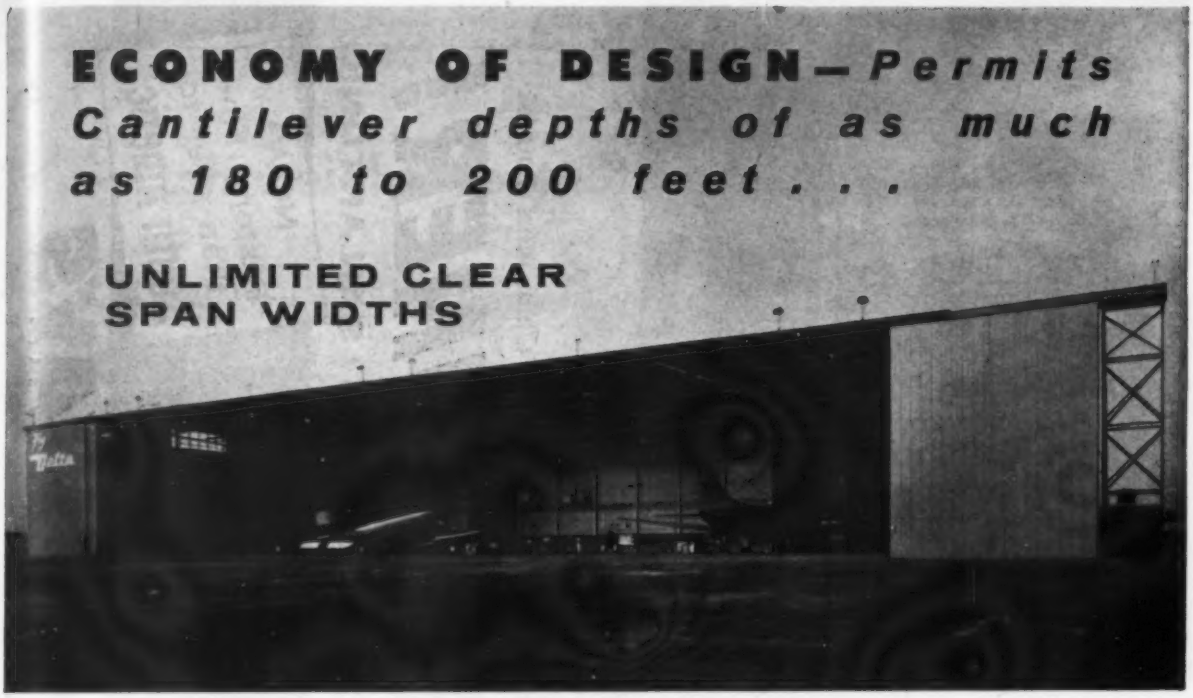

Pictured above is the Delta Airlines medium size hangar. It serves as a turn-around base for two DC-8's or Convair 880's. When the future demands more space this hangar can easily be modified to meet any requirements. This first investment never becomes obsolete or outmoded.

ERWIN-NEWMAN *Suspended Cantilever provides for future* EXPANSION

The economy and utility of ERWIN-NEWMAN Suspended Cantilever design provides the ultimate in hangar construction. ECONOMY — The suspended cantilever hangar is considerably cheaper than older style cantilever (from $5.00 to $10.00 less per square foot). UTILITY—Suspended Cantilever construction permits depths of 180 to 200 feet and clear span widths up to several hundred feet. ERWIN-NEWMAN hangars are built with the expandable future in mind—depth and width can be increased, vertical clearance can be added by placing tail gates at any number of points desired, across the front.

ERWIN-NEWMAN Cantilever type construction, engineering and fabricating has proved to be the efficient and economical answer for hangar requirements for fixed base operators, corporations, airports and airlines throughout these United States. ERWIN-NEWMAN has designed and constructed over 400 commercial hangars in the last twenty years. This "hangar know-how" can save you money in initial cost and hold to a minimum future expansion cost as needed.

Consult us (no obligation of course) before you plan or build a hangar of any size. ERWIN-NEWMAN will be glad to meet with you for talks on preliminary plans or any stage of planning.

Design Protected by U. S. Patent No. 2,687,102

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- Double Cantilever
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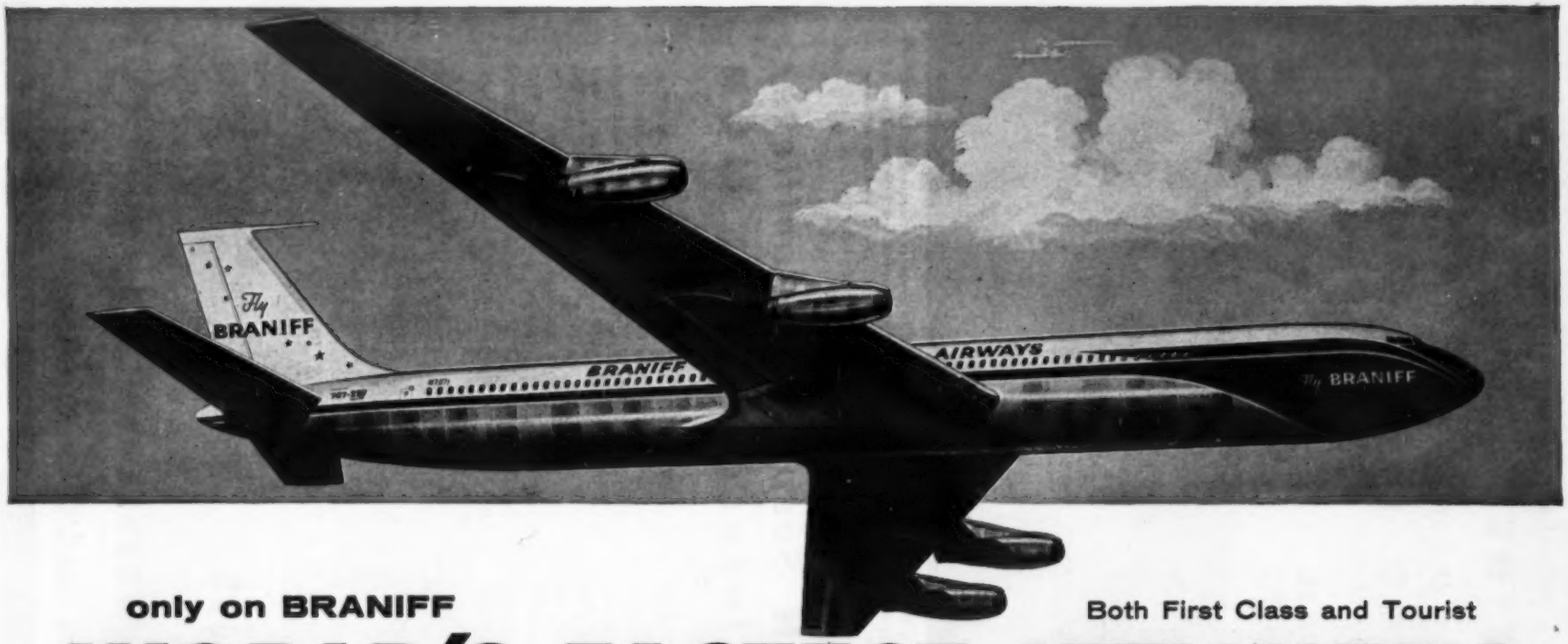

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AIRLIFT

Lightweight Seat Styled for Coaches

An advanced version of Burns Aerobus commuter seat designed for high-density operation of piston transports weighs only 11 lbs., about half that of usual coach seats. Despite this weight saving, the all-important dimension—between armrests—is 18 in., an inch more than customary.

The most pronounced departure from past aircraft seating is its non-reclinable design. The only moving part on the seat is the ash tray.

Here's the estimate by Burns of potential seating capacity:

749	78	(Wt.	858 lbs.)
1049	113	(Wt.	1243 lbs.)
DC-6B	114	(Wt.	11254 lbs.)
DC-7	117	(Wt.	1287 lbs.)
DC-7C	122	(Wt.	1342 lbs.)
240	80	(Wt.	880 lbs.)
340	85	(Wt.	935 lbs.)

All of the above are based on 32 in. seat spacing made possible by non-reclining features and generous underseat clearance. A DC-3 using slightly closer spacing (31 in.) could be fitted for 40 passengers.

Price? About $110 per seat place or $11,000 per 100-seat interior. Seats are designed for mounting on standard aircraft track installations and the only major modification involved in changeover would concern emergency exit provisions for the higher-density cabin layout. Brochure available.

Write: Dept. A/L, Burns Aero Seat Co., 3900 Cohasset St., P. O. Box 127, Burbank, Calif.

Burns

Radio Altimeter

A 25-lb., shoebox-size radio altimeter that indicates height of an aircraft within plus or minus three feet has been developed by Standard Telephone and Cables, Ltd.

The altimeter—model STR-41—was designed for the British Ministry of Aviation. It works by transmitting a signal to the ground and measuring the delay before the signal is reflected back. The result is displayed on an indicator that shows the aircraft's altitude in feet. The indicator reads in two ranges: 0-500 ft. and 0-5,000 ft.

A special output is provided for a 0-50 ft. range so that the altimeter can be coordinated with instrument landing systems.

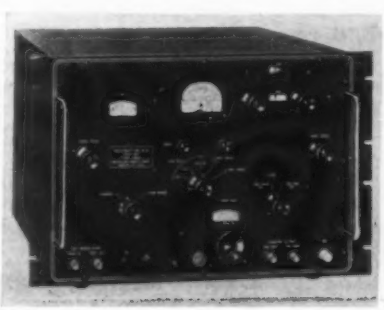
Write: Dept. A/L, International Telephone and Telegraph Corp., 67 Broad Street, New York 4, N.Y.

Navaid Test Set

A navaid test set (Type 235-A) which provides all the RF circuitry required for bench testing and calibrating ATC transponders and airborne DMET navigation systems has been announced by Boonton Radio Corp.

The unit has three basic interconnected units: a crystal-controlled RF signal generator; peak pulse power comparator; and wavemeter. Used in conjunction with Collins 578x1 transponder bench test set or 578D-1 DMET bench test set and a suitable oscilloscope, the unit is capable of performing all basic tests in accordance with ARINC characteristic 521-B and 532-B.

The RF signal generator provides crystal-controlled outputs spaced 1 Mc in the range 960 to 1049 Mc and 1130 to 1219 Mc, accurate to plus or minus 0.005 percent. Output levels are −10 to −100 dbm. Power comparator indicates from 23 to 33 dbm plus or minus 1.5 db over the range from 960 to 1215 Mc.



Wavemeter covers range from 1070 to 1110 Mc and is accurate to plus or minus 0.5 Mc.

Write: Dept. A/L, Boonton Radio Corp., Boonton, New Jersey.

Jet Igniters

Two new long-life jet igniters approved by Pratt and Whitney and FAA for Boeing 707 and Douglas DC-8 engines have been developed by Champion Spark Plug Co.

The new AA37S is for the JT3 engine and will replace the Champion AA158. The AA42S is designed for the JT4 and replaces Champion AA16S.

The igniters were developed to provide increased service life despite new jet operating procedures which call for keeping ignition on for longer periods of time.

Write: Dept. A/L, Champion Spark Plug Co., Toledo, Ohio.

Hydraulic Filters

Two new high pressure hydraulic filters rated at 3.5 gpm and 10 gpm are now available from the Bendix Filter Division.

Units are nominally rated at 10 microns. They contain filter elements made from special pleated, resin impregnated cellulose

Call any Braniff office or your travel agent. General Office: Dallas, Texas

fiber sheet. Both assemblies have a pressure drop of 30 psig at their respective flow rates with MIL-H-5606 fluid at 100 deg. plus or minus 10 deg. F. Temperature rating ranges from minus 65F to plus 275F.

Rated operating pressure for both assemblies is 3,000 psi with a rated impulse burst pressure of 7,500 psi. The 10 gpm assembly weighs 1.3 lb. and has AND 10050-10 porting. The 3.5 gpm unit weighs 0.7 lb. and has AND 10050-6 porting.

Units can be used for filtering aviation gasoline, kerosene, RP-1, JP-4, JP-5, S-45, Skydrol 500, Oronite 8515, water, acetone, trichlorethylene, petroleum ether, alcohol, air, gaseous oxygen, gaseous nitrogen, helium, MIL-L-7808, lubrication oils and other related fluids.

Write: Dept. A/L, Bendix Filter Div., P.O. Box 135, 434 W. Twelve Mile Rd., Madison Heights, Mich

Vibration Detector

Sperry Gyroscope Co. has announced development of a portable vibration analyzer which the company says can pinpoint hidden sources of vibration problems in turbine engines.

The analyzer is designed to show if each of the engine's major rotating components and accessories is vibration-free. If vibration exists the machine will indicate the accessory or major component at fault.

Sperry has pointed out the great cost saving resulting from elimination of the tear-down costs heretofore encountered with previous methods.

Write: Dept. A/L, Sperry Gyroscope Co., Great Neck, L.I., New York.

Placard Lights

Lights for illuminating legends on rectangular legend plates are being provided by Dialight Corp. to indicate the state of

an electronic circuit in aircraft.

A special feature is ease of relamping. Finger pressure on a release pin opens the top plate for lamp change without special tools.

Legends are inscribed on plates which serve as lenses. They are made of transparent plastic and come in sizes up to 1 3/16 by 9/32 in. Positive or negative legends may be used.

Each Dialco "Placard Light" houses two T-1-3/4 midget flange base incandescent bulbs of 6, 14 or 28 v, as required. Four series are available, with a variety of configurations.

Write: Dept. A/L, R. E. Greene, Dialight Corp., 60 Stewart Ave., Brooklyn 37, N. Y. Ask for Bulletin PL-2B.

Jet Engine Starter

A mobile, continuous-flow jet engine starter which chops to less than fifty cents the average cost of starting a jet power plant has been developed for airline use.

The Breeze Corp. "Jetair" starter can also be used to check cabin pressurization systems, to supply heated low-pressure air for checking de-icing equipment, to power pneumatic air conditioning units during ground operations, and to check aircraft fuel pumps and lubrication lines in hangars.

The unit is designed for the P&W JT-3 and JT-4, Rolls-Royce Conway, Allison 501 and G.E. CJ-805 jet engines, and it can be modified for other gas turbine power plants when they become operational.

Write: Dept. A/L, Breeze Corp., Inc., 700 Liberty Ave., Union, New Jersey.

Maintenance Dolly

A maintenance dolly designed for ground handling of P & W JT4-A3 jet engines has been designed by Sabena and will be produced in the company's own workshops. Of 28 units to be built, 12 will be retained by Sabena. The remainder will be purchased by PAA, TWA, Alitalia, Air France and T.A.I.

The positioner can support up to four

tons. It can be handled easily, and a team of four men can use it to change a jet engine in two hours.

The engine is carried on two parallel rails. Height is adjustable by two hydraulic

Polymers Cure a Joint Headache

Off with the Old . . .

Condition of conventional expansion joint sealants demonstrates how jet blasts and solvent fuels ruined sealant at Tulsa airfield. Old material had to be removed with saws and brushes.

Polysulfied liquid polymer compounds produced by the Thiokol Chemical Corp. are being used to lick a knotty waterproofing problem on the runways at Tulsa Municipal Airport.

Superheated blasts from jet engines melted conventional joint sealers and blew them out of expansion joints between sections of runway and apron concrete. The conventional sealants were also under constant attack from another enemy—jet fuels, which softened and disintegrated them.

With the sealant displaced, rain water invaded the joints and began to wash away the subsoil. The result: whole concrete slabs began to rock under the weight of 100-ton aircraft. In winter, trapped water would freeze and crack the concrete.

To solve the problem, airport officials turned to Jet Seal, a polysulfide liquid polymer compound manufactured by Allied Materials Corp. of Oklahoma City. The new compound is unaffected by jet fuels, will not sustain flame or melt under temperatures up to 500 deg. F, and will remain elastic in temperatures as low as minus 65 deg. F.

The compound is applied with a gun-type applicator after removal of all of the old sealant. It is expected to last for at least 10 years.

On with the New . . .

Photos from the Thiokol Corp.

Application of polysulfide-based sealant is accomplished with specially-designed gun. Sealant flows into joint, then cures to an elastic, heat and fuel-resistant seal, with a life expectancy of 10 years.

pumps which operate four screw-jacks equipped with mechanical clamps. Special screw assemblies also permit roll, tilt and yaw movements.

The unit rides on four wheels with pneumatic tires. Weighing one and a half tons and composed of 900 separate pieces, it can be quickly dismantled to a few subassemblies and loaded into an aircraft.

Write: Dept. A/L, Sabena Belgian World Airlines, Sabena Building, 720 Fifth Ave., New York 19.

Aircraft Seat

Under way at Airline Products, Inc. is a contour-engineered, FAA-approved aircraft seat known as the Trimline, Model 918.

Weighing less than 18 lbs., the Trimline features a "therapeutic design" said to support the body at all critical areas, reducing fatigue and relieving vibration. Seat bottom width is 18 in. Unit is designed for high density use.

Seat is furnished ready for installation,

complete with seat belts as well as approved floor attachments. It can be installed on 33-in. centers with floor attachments on 14-in. centers. Colors and fabrics may be selected to suit.

Write: Dept. A/L, Airline Products, Inc., 5536 Satsuma Ave., North Hollywood, Calif.

Transponder Tester

One of a number of new Wilcox units designed for use in CANARI (Communications and Navigation Airborne Radio Instrumentation) systems is the model 758 transponder function tester. It provides a reliable means of determining when an aircraft's transponder is being interrogated from the ground.

In-flight interrogation causes an indicator light to glow. A switch in the cockpit can also be used for testing. Unit weighs less than 1 lb., requires 275 ma @ 27.5v DC, contains three transistors, provides insertion loss of less than 0.2 db with no measurable change in transmission line VSWR.

Other new Wilcox equipment are a new SSB transmitter, the Model 96 SSB, which has a nominal output of 5 kw at any frequency from 2 to 32 megacycles. Another, the Model 99 SSB, is a one-kilowatt transmitter.

On the receiver side, new units include a Model 605A converter for SSB adaptation of SP-600, R-390 and similar equipment. A Model 605 SSB "strip" receiver is available to adapt an HF tunable receiver such as the SP-600 to SSB reception.

Write: Dept. A/L, Wilcox Electric Co., Inc., 1400 Chestnut St., Kansas City 27, Mo.

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An automatic shock absorber which affords better crash survival protection for passengers has been marketed by Hardman Tool and Engineering Co.

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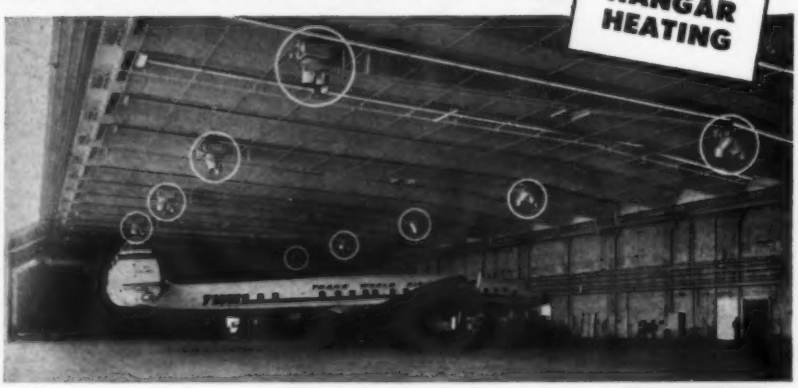

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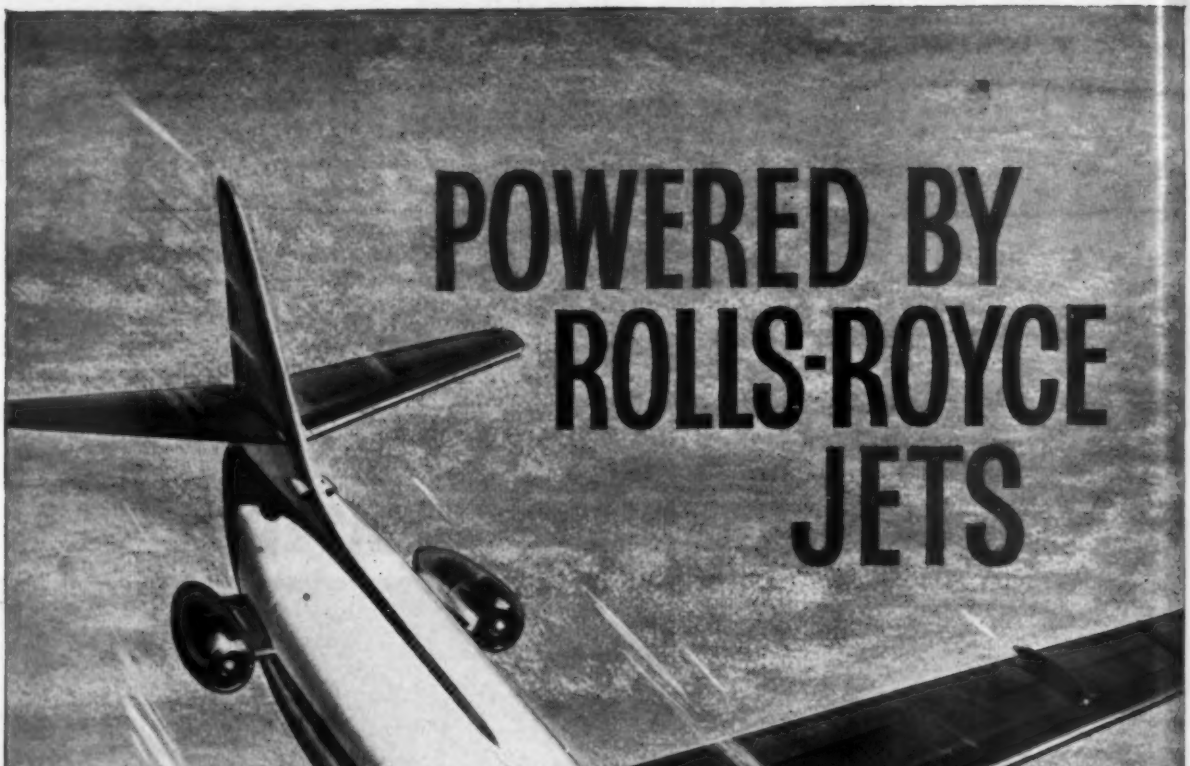

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INFO FOR THE ASKING

Airborne bolts—New bolt catalog has 40 pages of specifications on bolts designed for aviation use.

Write: Dept. A/L, Aircraft Bolt Corp., 543 Monterey Pass Road, Monterey Park, Calif.

Aircraft instruments—Forty-eight-page manual describes complete line of aviation instruments and components made by Weston.

Write: Dept. A/L, Weston Instruments, Daystrom Inc., 614 Frelinghuysen, Ave., Newark, New Jersey.

Corporate B-26—Another version of the B-26 in corporate clothes is explained in brochure which describes 10-passenger, pressurized evolution. Executive model is called Biscayne-26.

Write: Dept. A/L, L. B. Smith Aircraft Corp., International Airport, Miami, Florida.

Aviation consultants—Booklet from Aviation Consultants, Inc., lists services to aviation industry.

Write: Dept. A/L, Aviation Consultants, Inc., 2550 East Foothill Boulevard, Pasadena, Calif.

Aviation dealer—Pamphlet tells the story of Kindred Aviation, distributor for more than 100 aviation products' manufacturers.

Write: Dept. A/L, Kindred Aviation, Inc., 3519 Pacific Ave., P.O. Box 630, Burbank, Calif.

Aviation controls—Story of Chandler Evans activities in the aviation controls field is told in 20-page illustrated booklet.

Write: Dept. A/L, Chandler Evans Corp., West Hartford 1, Conn.

Fuel pumps—Catalog lists pumps used for aircraft fuel transfer, mid-air refueling, water injection, and fuel jettison.

Write: Dept. A/L, J. C. Carter Co., Costa Mesa, Calif.

Automatic loading—Service and instruction manual describes automatic bottom loading equipment and its uses.

Write: Dept. A/L, Avery-Hardoll, Ltd., Oakcroft Road, Chessington, Surrey, Gt. Britain.

Heated windshields—Sierracin folder lists pros and cons of standard versus Sierracoted windshields. Also ask for folder, "New Look for Aircraft."

Write: Dept. A/L, Sierracin Corp., 903 North Victory Blvd., Burbank, Calif.

Luxury DC-3—William C. Wold Associates has luxury version of the DC-3. Pamphlet tells the story.

Write: Dept. A/L, William C. Wold Associates, 551 Fifth Ave., New York 17, N.Y.

Environmental testing—Wilcox Electric Co. describes environmental test facility and capabilities of Wilcox test equipment.

Write: Dept. A/L, c/o H. P. van Leuven, Wilcox Electric Co., Inc., 14th and Chestnut, Kansas City 27, Mo.

Roller bearings—Catalog 59120 covers Chain Belt Co.'s complete line of standard

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• General Electric will furnish silicon DC power supplies for Convair 880s and 600s. Twenty-five percent lighter in weight, the convection-cooled units have no moving parts.

• Heavy backlog of orders has forced Standard Railway Equipment Mfg. Co., Chicago, to transfer production of "Jetway" loading walkways from its P.I. Steel Corp. plant in Los Angeles to the subsidiary's Ogden, Utah, facility. Current orders total 55.

• A $6 million contract for eight long range air traffic control radars has been awarded Raytheon Co. by the FAA. Radar units will be located in Charlotte, N.C.; Elko, Nev.; Milford, Utah; Rock Springs, Wyo.; West Branch, Iowa; Grand Junction, Colo.; North Platte, Neb. and Wheatland, Wyo.

• FAA has ordered 38 radar bright display systems from the General Instrument Corp., Newark, New Jersey.

• Ekco Type E160 airborne weather radar is being fitted for Trans Arabian Airways in two Armstrong Whitworth Argosy air freighters. The Argosy is the first British commercial aircraft to include weather radar as standard equipment.

• Full line of data recorders and data reduction equipment developed by Royston Instruments, Ltd., of Gt. Britain will be handled in the western hemisphere and Australasia by Lockheed Aircraft Service.

• Collins Radio Co. (Australasia) PTY Ltd. is the name of a subsidiary formed to promote Collins products in the Australian, New Zealand and southeast Asian areas.

• Twenty aircraft operators and MATS presently are using Edo Loran navigation equipment for over-water travel. Equipment is produced by the Edo Corp., College Point, L.I., New York.

• First installation of lightweight "Euphorian" aircraft seats was made recently in Phillips Petroleum's Grumman Gulfstream.

• An electronic flight simulator for Boeing 720 operators has been installed at the Denver flight training center of United Air Lines. Unit was made by Link Aviation, Inc.

• A leasing plan for weather radar has been put forth by the Radio Corp. of America. Commercial airlines will negotiate directly with RCA while executive aircraft owners will deal with authorized RCA dealers.

• Contract for hydraulics accessories test stand has been awarded to REF Mfg. Corp., Mineola, N.Y., by Scandinavian Airlines System, to service the airline's fleet of DC-8s.

• Complete line of Mercer Robinson (Clifton, N.J.) Engineering Corp. air cargo and airline baggage handling equipment, wheel tractor and mobile cranes, fork lift trucks and other apparatus will be manufactured by Lehigh, Inc., Easton, Pa.

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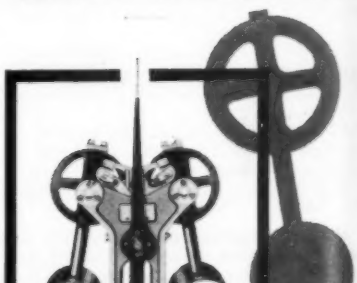

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Wayne W. Parrish

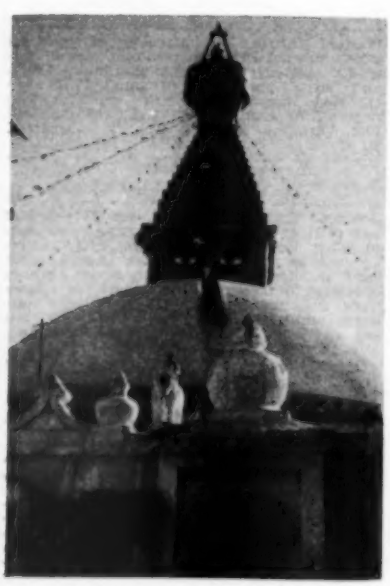
Placid Milieu is Setting For Ageless Nepalese Shrine

A few miles east of Kathmandu, the capital of that lovely little country of Nepal, is one of the most celebrated places of the Lamaist branch of Buddhism.

It is called Boudhnath Stupa. A stupa, I learned, is a hemispherical mound or tower serving a Buddhist shrine, and this one, among the biggest in the world, was sheathed in gold. It could be seen from quite a distance. On the top of the huge mound was a terraced tower, also in gold. Considering the fact that it was built over 2,000 years ago, it is not only an ageless architectural beauty but a real achievement in construction.

To get to Boudhnath requires a little fortitude. An automobile simply couldn't make it over those centuries-old roads with their deep age-old ruts and steep inclines built for animals and people. So we (meaning my wife and me, Ralph Cohen of IATA and a polite and intelligent young Nepalese driver who was working for the U.S. mission there) left the Hotel Royal in a Land Rover, a somewhat larger and sturdy British version of the American Jeep. We forgot all about the roughness of the trip as we bounced our way through enchantingly picturesque villages and passed near many shrines and temples of either the Buddhist or Hindu religions.

Rarely, if ever, have I spent a more delightful afternoon. The sun was warm and the air clear. Along the entire horizon to the north stretching for a hundred miles in either direction were the massive snow-covered Himalaya. A dozen famous peaks including Mt. Everest were in view against the deep blue sky. The Land Rover carried us back into the centuries of this unchanged land, far, far away from a turbulent world of social change, nationalism, hatreds and the harshness of the 20th Century.



View of the Boudhnath Stupa.

We drove into a village along a street just wide enough for our vehicle. Shops difficult to describe were on each side. Then the Land Rover made a sharp turn which led into a large courtyard in which the magnificent Boudhnath Stupa was the centerpiece. Around the paved courtyard, much as one might find in old Dutch or Belgian or even English towns, were three and four story brick houses adorned with attractive carved woods.

Scene from the past

It was not only a charming setting, but a placid one. There were no noises of street traffic, no commercialism, no advertising signs, no radios blaring moronic music. On the pavement around one side men and women were spreading out seeds to dry, or sifting rice, all by the most primitive methods. In one portion women were spreading out fresh cow dung with their bare hands to dry on the hot paving blocks, for use later as fuel or Lord knows what other purposes.

We were in one of the most celebrated places of Lamaist pilgrimages outside Tibet. The shrine has been in existence even before the reincarnation of Buddha whose birth was 2,500 years ago. The main structure itself was not open, but we were told that it contains precious relics. There were many small shrines on terraces below the stupa. Extending for almost the entire distance around the exterior were scores of prayer wheels.

An introduction

Our Nepalese friend asked us if we would like to meet the China Lama, who lived in a house on the far side of the courtyard. We said yes, of course, but at this point I realized how little I knew about Buddhism, especially that part ruled by the Dalai Lama. (When we were in Nepal the Dalai Lama had not yet escaped from the Red Chinese into India. The Reds have apparently ruthlessly beaten the religious Tibetans into submission by now).

The China Lama, it turned out, was the direct representative in Nepal of the Dalai Lama. The close association with Tibet became clear enough when we were approached by two Tibetans wanting to sell us hand-made knives. They had come down from the high Himalaya to trade. They were dressed in typical heavy Tibetan dress, trimmed with fur. Quite shy, and unable even to speak to our Nepalese friend, they withdrew without pressing a sale.

Photos by WWP

The China Lama in front of his house.

As we neared the Lama's house, a four-story hand-made brick affair, a cow and calf wandered through the open front door. (In Nepal, as in India, the cow is sacred and can wander anywhere and woe be unto he who injures or kills one). I wondered what sort of place the China Lama lived in, but as we entered we discovered that all of the living quarters are on the second floor and above. The cow and calf had wandered into an inner courtyard.

Our friend sent a request to the sacred personage to see us. He extended a welcome immediately. So up a steep flight of wooden stairs we went into a two-room suite to meet a medium-size intelligent looking man in robes. He spoke excellent English (and many other languages as we found out). He invited us into his bedroom and told us we didn't need to take off our shoes, which would have been the custom usually.

Engaging personality

We sat on chairs while the Lama rose to his four-poster bed and sat on his crossed legs. For a half hour we answered his questions about the U.S. and other parts of the world—he was remarkably well informed and current—while we asked questions about Tibet and Buddhism. Once he went into a trance. I'm not one for the mystical side of life but watching him was a truly remarkable experience. I felt that I was in the presence of a someone who was actually mystical, or super-human, or what have you. And indeed he was a most engaging, intelligent individual.

He likes visitors. To westerners he is quite informal, so much so that when Ralph Cohen hesitatingly asked him if he would pose for our cameras, he not only quickly obliged but donned some more colorful robes and took his jeweled prayer wheel with him to pose in front of his house. I have never felt farther away from the brash, noisy, turbulent "civilized" world than I did that afternoon.

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